The Electrical Industry's Weekly Magazine

November 24, 1958

Electrical World

Price 50 Cents

A McGraw-Hill Publication

3 Utilities Switch to Computers for Billing Customers

Detroit Edison Prepares 33,500 Bills Per Day .....p 54

Wisconsin Electric Power Saves $20,000 Yearly .....p 57

Ohio Edison Reduces Labor Costs Without Layoffs .....p 60

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AEIC Studies New Problems . . . p 52

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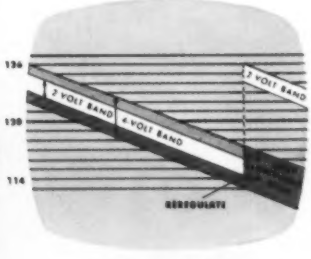
ALLIS-CHALMERS — 25 years of 5/8% Regulator Leadership

4 steps to "Engineered Regulation"

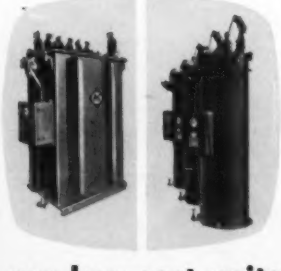
Plan to stay ahead... MODERNIZE!

- cut revenue loss
- cut cost of regulation
- improve service

cut band width



reregulate



use low-cost units

use smaller ratings

All power systems use regulation, but few realize the greatest possible benefits. That is why the "engineered regulation" approach is recommended.

"Engineered regulation" means:

1. Use narrow 2-volt band widths.
2. Reregulate feeders.
3. Use lower cost 5/8% step regulators.
4. Utilize the complete potential of *Vari-Amp* and its short-circuit ratings so the smallest, lowest cost unit can be used at a given location.

"Engineered regulation" is an art. Allis-Chalmers engineers can be of great assistance to you. Call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

Vari-Amp is an Allis-Chalmers trademark.

Originators of 5/8% Step Regulators

ALLIS-CHALMERS A-C ALLIS-CHALMERS

A-5859

Electrical World

Vol. 150, No. 21 NOVEMBER 24, 1958

Published for 84 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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Medium Computer Proves Its Value

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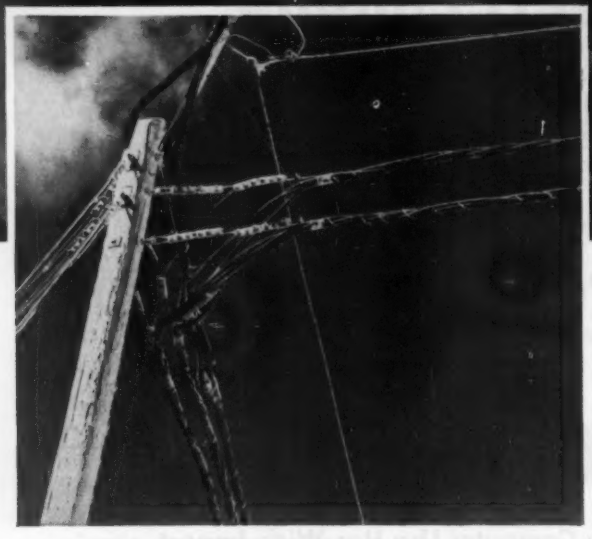

As the power goes . . . so go the operating costs at Intermountain Chemical Co.'s highly mechanized mining and refining operation. And every bit of this power—for digging, hoisting and processing of the ore—comes from Intermountain's power plant through 5kv non-shielded Okolite-Okoprene self-supporting aerial cables. They needed utmost dependability—and got it!

Heavy concentration of corrosive soda ash dust and severe environmental conditions have no effect at all on this aerial cable. Note the simple, low-cost support pole—no cross-arms needed—as well as the easy installation and splicing procedures used for this light weight, unshielded 5kv cable.

Okolite-Okoprene Aerial Cables withstand chemical contamination . . . assure continuous production at Intermountain

"These 5,000-volt aerial cables have withstood heavy concentrations of soda ash dust for eight years now," says Louis Ruffini, staff assistant to the maintenance superintendent for Intermountain Chemical Company of Wyoming. "They've proved to be invulnerable to temperatures as low as —40°F and as high as 120°. They've faced winds up to 70 mph, and they tested perfectly at 40,000 volts d-c. We expect them to be around a long time yet."

These facts are vital to Intermountain. The company depends almost completely on electrical power to mine trona ore and refine it into almost half a million tons of soda ash per year. That's why they stress the dependability of their Okolite-Okoprene, 3/c, self-supporting power cables with aluminum conductors, cables that distribute power to every sub-station in the mine and processing plant.

"Installation of the aerial cables was very simple," says Mr. Ruffini, "thanks to their flexibility, light weight, and self-supported Dualay construction . . . and due also to the unshielded 5,000-volt construction that permitted the simplest of splicing and terminating procedures."

For *your* power needs, this construction can offer installation and operating economies, combined with long-term dependability. Okolite insulation has a 30-year record of service, maintaining in severest installation conditions its high dielectric strength and great resistance to corona cutting, moisture and heat. Okoprene sheath offers unusual protection against weather, abrasion, ozone, heat, cold, many acids, alkalies and chemicals. Application by the strip process of both insulation and sheath is the final assurance of matchless performance and long life. For the Okolite-Okoprene self-supporting aerial cable that best suits your needs, see 56-page Bulletin EW-1074. It's free . . . just write The Okonite Company, Passaic, N. J.

where there's electrical power . . . there's **OKONITE CABLE**

6216

Which Way Will They Go?

Two more rural electric cooperatives—one in Indiana and the other in Ohio—have repaid in full the money they borrowed from the Rural Electrification Administration to build their systems.

They are the Noble County Rural Electric Membership Corp of Albion, Ind., and the Logan County Cooperative Power & Light Association of Bellefontaine, Ohio.

Five other cooperatives have also paid the government in full out of revenues, according to the Agriculture Department.

We wonder what these electric cooperatives are going to do now when they realize the full implications of their success. Will they form a private tax-paying electric utility, or continue to live under government subsidy?

Over the past twenty years we have heard the argument that it is essential for the co-ops to have a subsidy in order to bring electricity to the farmer. Now that they have reached this successful point of paying off all government debt, what will be their next move?

We will not offer any advice in this column. If properly presented, we believe the free enterprise course may appeal most to the farmer members of these co-ops.

Fischer Black

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the price is RIGHT!

TYPE M STRAND

If someone asked you the price of Copperweld Strand, the chances are that you'd err on the high side. Why?

Simply because this permanently non-rusting guy and messenger strand has for more than 40 years been rated absolute tops in its field. Judged by the admittedly longer service and maintenance-free life its use assures, you'd naturally expect it to cost more—much more. But that's no longer true.

Now, with the new Type M Strand, you can obtain all the money-saving and performance advantages of Copperweld construction at a price comparable to that of ordinary strand. This was made possible by developing new higher strengths especially suited for guy and messenger use, and introducing new cost-cutting production techniques.

Pliable and easy to handle, this superior strand is available in a complete range of breaking strengths. Ask us to quote on your guy and messenger requirements. You'll find the price is right.

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

Furnished in coils of 250, 500 and 1,000 feet depending on the size. Reels of 2,500, 5,000 and 10,000 feet are also available.

Copperweld®

TYPE M

GUY and MESSENGER STRAND

A 15-kv 400-amp station-type disconnect at a distribution disconnect price

No Sticking!...No Burning! No Pitting!...No Welding Shut!

Silver-weld contacts, a unique new development, provide 20,000 ampere momentary rating for this distribution disconnect

How is it possible to get this performance?

The answer lies in the methods of applying silver to the contact surfaces.

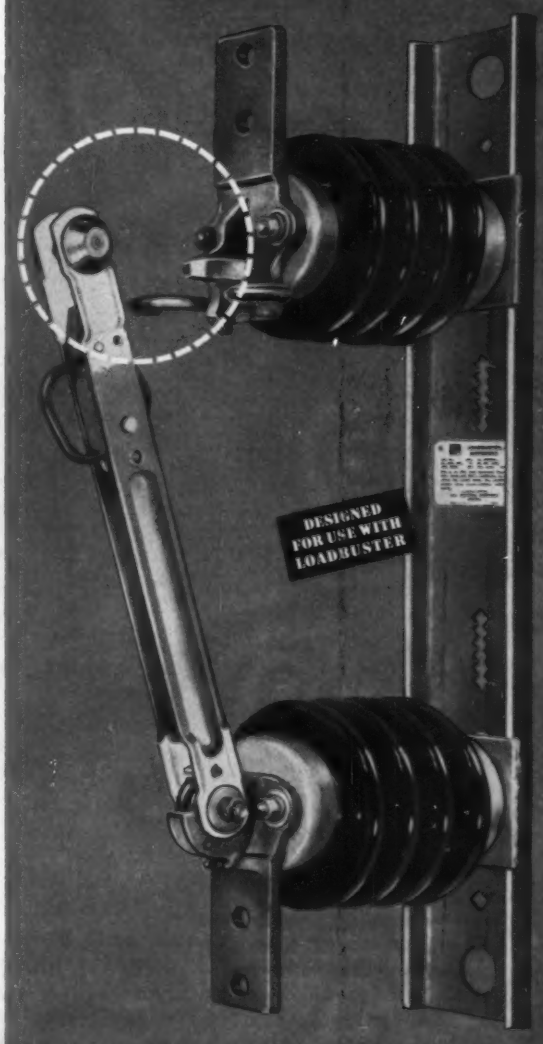
To apply silver to the contact castings, a new, patented process is used which includes special preparation of the contact surfaces, preheating them in a neutral atmosphere, fusing onto them molten particles of silver alloy, and then coining for hardness control, contour, and low porosity.

To apply silver to the blade, another method is used. The blade is silver-clad with extra-thick, high-density, low-porosity silver.

The result is a silver-to-silver contact which does not seize or gall and which makes possible the high current ratings.

But performance of a new disconnect is one matter, and performance after normal usage and exposure to atmospheric contamination is another. In practice, a distribution disconnect may be left in the open or in the closed positions for very long periods, with contacts exposed to corrosive atmospheres, typically without maintenance. Recognizing this fact, S&C has designed a disconnect that will carry its rated load, even after hanging open for long periods. On the other hand, this new S&C disconnect will open without difficulty, even after long exposure in the closed position.

And without extra cost, you get full load switching with LOADBUSTER® when you fit your distribution system with S&C LOADBUSTER Disconnects. Write today for Descriptive Bulletin 721, to S&C Electric Company, 4421 Ravenswood Avenue, Chicago 40, Illinois. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.



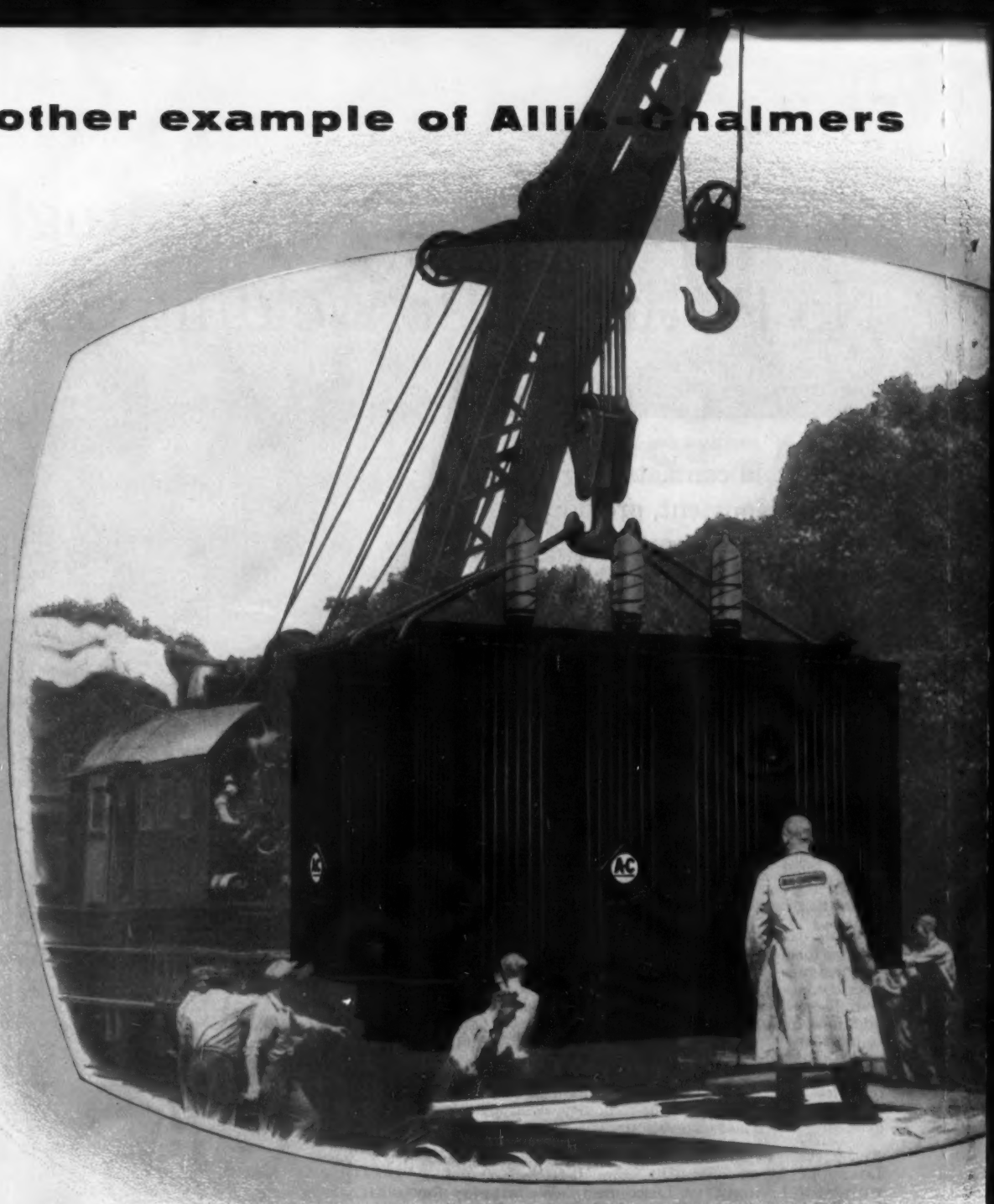
S&C

LOADBUSTER® DISCONNECTS

Disconnects • Cutouts • LOADBUSTER® • Load Interrupters • Metalclad Switchgear • Fuse Links • Power Fuses

Specialists in High-Voltage Circuit Interruption Since 1910

Another example of Allis-Chalmers



Balanced Design

Once an Allis-Chalmers transformer is on the line, you can look forward to years of extra dependable service because *Balanced Design* includes: *Corona-Free* insulation, high impulse strength, uniform cooling, high short-circuit strength, weather-tight construction . . . and many other superior features. Ask your A-C man for all the details, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

Welded-on radiators are pressure-tested at the factory. Bushings are also installed at the factory to reduce installation time.

leadership in transformers

Large factory-assembled transformers moved from train into position and...

on the line in less than 4 hours

A. J. Becker
Field Engineer

"MANY engineers are pleased to learn how quickly large power transformers can be installed. When you check the timesaving features of Allis-Chalmers transformers, the reasons for fast and easy installation become obvious."

Factory assembly where shipping clearances permit is one important reason. Factory-installed radiators and bushings leave nothing to be done at the site except grounding the tank, connecting high and low voltage bushings, and completing system electrical test checks. Building transformers as large as 20,000 kva using this construction has become routine at Allis-Chalmers.

Ski-base helps save time also. It permits rolling or skidding in any direction. Turned-up ski ends ride smoothly on all types of rollers without gouging or digging in. Eyeholes in the corners of the base make winching into position easy. Corner jack lugs are designed with ample clearance, and are clear of cooling tubes.

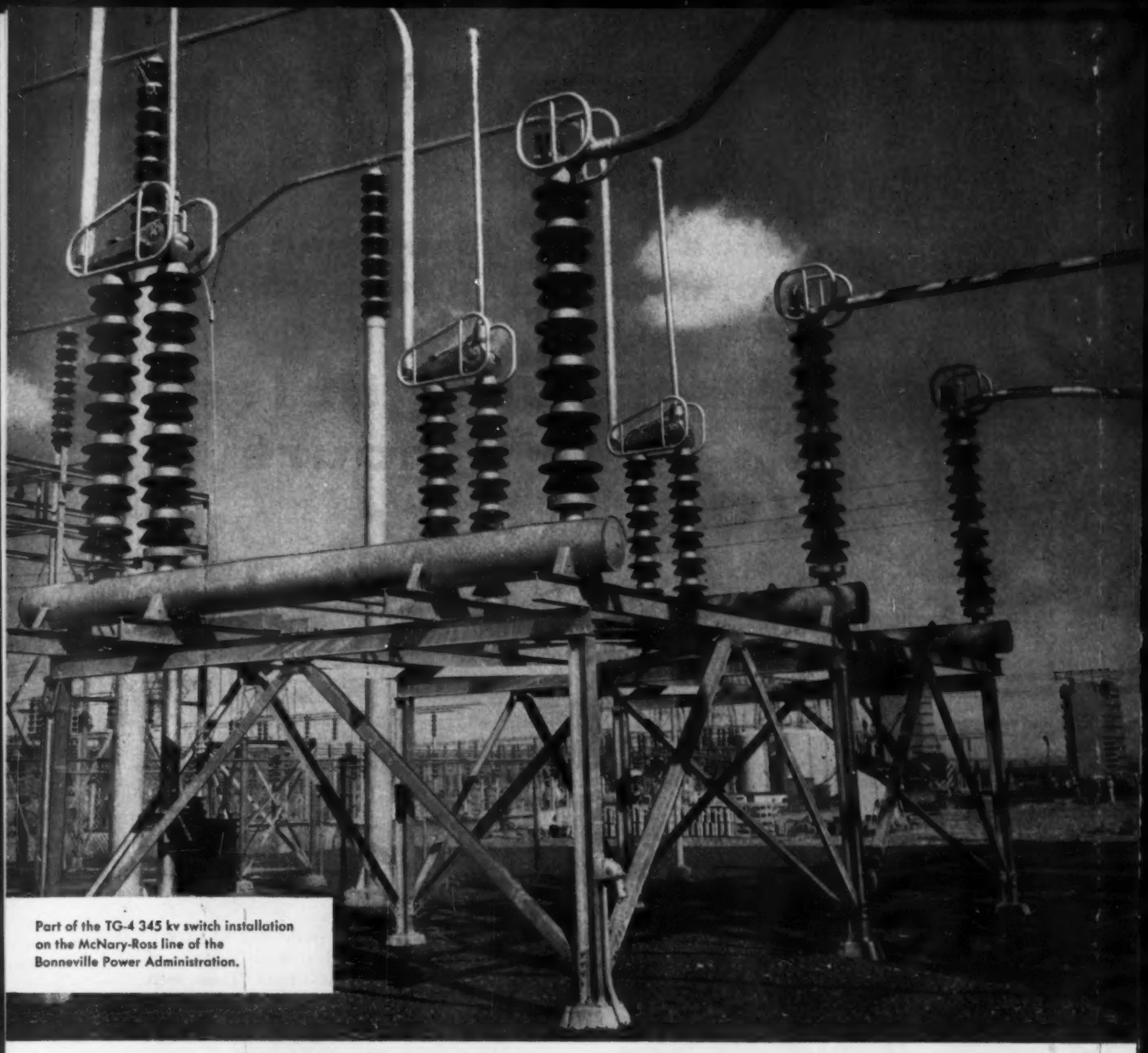
Another reason behind fast installation is the nation-wide staff of experienced Allis-Chalmers field engineers... like A. J. Becker, with 36 years of experience inspecting, testing and installing A-C transformers. These men *know* transformers. They offer on-the-spot guidance to make installation smooth and quick.

A-C ALLIS-CHALMERS

A-5694

Ski-shaped base of heavy I-beam cross supports permits moving in any direction. Reinforced clevis hole gives extra tow strength.

Ample jacking clearance and working space plus broad, flat surfaces for lifting jacks save hours of installation time.



Part of the TG-4 345 kv switch installation on the McNary-Ross line of the Bonneville Power Administration.

FROM AIR SWITCHES TO COMPLETE SUBSTATIONS A DEPENDABLE SINGLE-SOURCE FOR ALL YOUR SWITCHGEAR REQUIREMENTS

Federal Pacific TG-4 air switches (illustrated above), were among the first in this country to go into service at 345 kv. Providing consistently safe, trouble-free operation, these extra-high-voltage switches demonstrate the switchgear design leadership Federal Pacific offers you.

Of advanced, simplified design, the TG-4 is available in BIL ratings from 1300 to 1800 kv, 1600 amp continuous current and 70,000 amp momentary current ratings to meet the ever-accelerating trend toward higher and higher voltages.

Whatever your needs—switchboards, low voltage metal-enclosed, medium voltage metal-clad, unit substations, power circuit breakers, power switching equipment or complete substations—you can depend upon Federal Pacific for quality switchgear. For further information write Department APR, Federal Pacific Electric Company, 50 Paris Street, Newark 1, N. J.

FEDERAL FPE PACIFIC

Better Products to Control Electricity

The Electrical Week

FUTURE NEWS ▶ **Watch for more utilities to capitalize entrance panelboards.** At least two are considering it to improve Housepower.

LATE NEWS ▶ **Dayton P&L-UWUA agree on 11¢/hr wage hike** . . . Labor Dept raises exemption level of executives, professionals, and administrators from minimum wage and overtime provisions of Fair Labor Standards Act, effective Feb. 2. Execs must get at least $80 a week to qualify for exemption (vs. $55 now); administrators and professionals, $95 minimum (vs. $75).

Installed hydro capacity of 3.3-million kw will be added to present federal systems, says Reclamation Commissioner W. A. Dexheimer.

FPC reopens hearings Nov. 24 on Tuscarora Indians complaint that Niagara Falls reservoir should not go on their reservation.

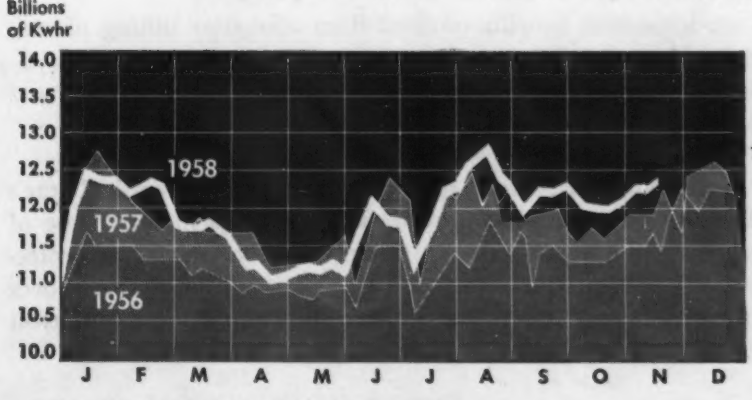
To qualify for federal aid on "third-round" reactor plan, utilities must meet AEC specifications on types, sizes, and deadlines. AEC also eased heavy water availability.

Can a town condemn power company property for its municipal system? This question embroils Thibodaux, La., and Louisiana P&L. After LP&L got a Federal District Court to halt encroachment, the town won a Court of Appeals ruling, upsetting the delay order. U. S. Supreme Court will decide on legality of District Court's delay action.

Rate changes . . . Public Service E&G seeks $21.4-million yearly increase, or about $9 million net after taxes . . . Ohio Midland gets $86,188 annual hike for a 2.27% rate of return.

Management changes . . . F. K. McCune, GE vp, is new Atomic Industrial Forum head . . . Indiana PS names Harold Golberg chief engineer.

POWER OUTPUT—UP 3.6% (Week ending Nov. 15), Kwhr 12,378,000,000



Per Cent Change From Previous Year

	Nov. 1	Nov. 8	Nov. 15
Total U. S. ..	+4.0	+3.3	+3.6
New Eng.	+6.0	+6.0	+7.1
Mid. Atlantic.	+3.6	+3.4	+3.2
Cent. Ind. ..	+2.5	+2.9	+2.4
West Cent. ..	+3.5	+2.2	+3.3
Southeast	+2.9	+2.7	+1.7
South Cent. .	+7.3	+5.1	+9.3
Rocky Mount..	+9.9	+5.9	+8.1
Pacific			
NW	+3.6	−0.2	+1.2
SW	+5.9	+5.5	+6.1

Seasonally Adjusted Index 236.8
Week Ago 237.4 Year Ago 228.2

Source: Edison Electric Institute

A TWO-MINUTE PREVIEW OF THIS ISSUE

EVENTS ▶ **Notes from the Atomic Industrial Forum Meeting,** held recently in Washington . . . Efforts to reach agreement on the long-range development of A-power are being renewed, with industry becoming increasingly impatient for getting on with the job of building economic reactors . . . Some experts think there may not be enough room for all the manufacturers now in the business . . . Consolidated Edison Co of New York's Vp James F. Fairman, keynote speaker, voiced for all a general dissatisfaction with atomic power progress to date. Details on p 48.

Bonneville is looking to California as a possible outlet for "non-firm interruptible" energy, Administrator Pearl confides to EW. Price would be low enough, he believes, to justify large transmission expenditures but, he agrees there'd be an element of risk (p 50).

A burden to future utility customers or stockholders is in the offing if "accelerated depreciation" is used to reduce rates, said F. Merrill Beatty of Arthur Anderson & Co before a hearing of the Maine Public Utilities Commission. Beatty testified on a $465,000 a year rate hike petition by Bangor Hydro-Electric Co. Opposition came from M. W. Van Scoyoc, an economist, who testified for the state in favor of using "AD" in rate making (p 51).

COMPUTER REPORT ▶ **The use of computers for customer billing is a "natural",** judging from the three by-lined reports appearing in this issue. Although those utilities using computers have generally been enthusiastic about their benefits, some question their impact on present operations. As with every other mechanical or electronic refinement, they are only as good as the people who operate them . . .

- **Using a computer for customer billing posed problems** in both departmental procedures and for personnel, at Detroit Edison Co, according to Vice President T. E. Hurns. He outlines his company's thinking about its new IBM 705 on p 54.

- **Another company, also using a computer for billing,** feels it has proved its value. John G. Gadby, assistant to the vice president and comptroller at Wisconsin Electric Power, tells why WEPCO feels the way it does about its IBM 650 (p 57).

- **Six important benefits resulted from computer billing** of residential and small commercial customer accounts at Ohio Edison. G. J. Gluck, general supervisor of customers accounting, credits and collections lists them as the lead to his story on p 60.

DISTRIBUTION ▶ **Will reclosers replace breakers as circuit loadings mount?** There's no definite answer yet, but growing loads and the increased use of aluminum put the emphasis on the time element in circuit protection; and the recloser (instantaneous trip) may have an advantage over the breaker (delayed trip). The problem is being explored at Detroit

Edison, using line-type, pole-mounted reclosers at substations in suburban and rural areas. Read about this interesting development on p 62.

HOW TO'S ▶ **Plastic inserts help find faults** at a Baltimore shopping center. Baltimore G&E, which developed the fault intelligence system, reports considerable savings result . . . A variety of materials handling problems have been solved at Indiana & Michigan Electric Co using a flexible-arm jib crane attachment developed there (p 65).

AEIC MEETING ▶ **The Association of Edison Illuminating Companies met Oct. 22 to 25** at White Sulphur Springs, W. Va., to discuss new developments and problems of the electric utility industry. Among many topics, delegates heard discussions of selective selling, load research, the future of atomic power, sample meter testing, air pollution, and the cyclical nature of turbine-generator orders. For the meeting report, turn to p 52. For more details on load see p 89.

MANUFACTURERS ▶ **Aluminum extruded distribution transformer tanks** have been developed by Reynolds Metals Co to accommodate transformers rated 25 kva and up. Company cites economy of maintenance, ease of welding, efficiency of cooling, and light weight as advantages . . . A line of single-phase step-voltage regulators in 27 distribution ratings has been designed by Pennsylvania Transformer Div of McGraw Edison Co. Design is patterned after the company's Pole Star distribution transformer . . . Rome Cable Corp will introduce an overhead primary distribution system intended for both utility and industrial distribution circuits from 5 to 15 kv (p 70).

NEW EQUIPMENT ▶ **Regulator by-pass switch performs all three steps** in removing a regulator from the line, ie, by-passing, disconnecting, and interrupting exciting current . . . High conductivity copper with all contact surfaces silver plated is being used in the manufacture of tee connectors . . . Integrating recorder measures, records, and continuously totalizes any linear variable with respect to time (p 80).

PEOPLE ▶ **Harold Quinton becomes chairman** and chief executive officer of Southern California Edison, succeeding W. C. Mullendore who will retire on Feb. 1, 1959. J. K. Horton, a vice president of Pacific Gas & Electric and president of the Alberta & Southern Gas Co Ltd, is named president . . . Bangor Hydro-Electric promotes Robert N. Haskell from executive vice president to president, succeeding Edward M. Graham, who is retiring as company president but who will continue as board chairman . . . S. A. Moxness is new president of Northwestern Public Service Co, succeeding G. R. McArthur who is named vice chairman of the board . . . Ohio Valley Electric Corp elects Wilbur H. Ruese vice president in charge of operations (p 98).

Purpose of the Brussels World Fair was to promote international friendship and understanding. The nations were to draw together and display their ways of life and demonstrate the fundamental unity of their aims. The Americans are to be praised for their effort to keep the spirit of the fair and to demonstrate their way of life. The American pavilion, set amid fountains and flowering trees, gave a welcome impression of lightness and friendliness. Inside was not salesmanship but a garden. Engineering marvels of all industrial countries looked very much alike. The similarity of these machines underlines their quest for a fuller, more leisured life. And in this common aim is the best hope that nations will coexist in peace. **Journal of I.E.E. (British) Sept. 1958.**

TECHNICAL NOTES

Transmission line conductors are strung during winter in Finland. The ice and snow form a protective layer on the ground preventing the conductor from being damaged and soiled.

To avoid excessive cavitation and to obtain stable operation of a Francis, or inward-flow reaction, turbine, the maximum operating head should not exceed 125% of the design head. And the minimum head should not be less than 65% of the design head.

Supercharging a pressure-fired boiler with the exhaust from a gas turbine has proven attractive for marine propulsion. Experience could be valuable for future utility use. In marine operations the gas turbine supplies only enough power to drive a compressor and inlet temperatures are low. Thus critical materials are not necessary.

Total conductor weight and number of units in each insulator string should be about the same for transmission of the same amount of power over either ± 200 kv dc or 345 kv ac lines. Tower construction for the dc line, however, is simpler inasmuch as two rather than three conductor groups are employed.

FROM EDITORS IN THE FIELD

Use of ultraviolet radiation instead of vitamin D on young animals, infra-red rays as a means of fighting pests, and high-frequency currents for drying have added considerably to the utilization of electric power in Russian agriculture.

tough

O-B BUSHINGS HAVE EXTRA STRENGTH TO WITHSTAND SHOCKS OF TRANSPORTATION "BEYOND THE LINE OF DUTY"

Bushings often live the hardest life before you get them. Suspending heavy circuit breaker parts, they may have to endure the shocks of transportation — shocks that can cause horizontal displacement of parts, and that are not normally "in line of duty."

Cores of O-B condenser bushings are wound on advanced modern machinery. They are harder, tighter, much stiffer than customary. This greater stiffness is exploited to provide extra lower-end cantilever strength. Contact points between core and ground sleeve are located at strategic points, so that the core contributes *mechanically* to the bushing, as well as works electrically. Result: a bushing of great strength, for the exceptional as well as the routine demands.

Techniques, such as this, are the natural result of experience bred of nearly 50 years of successful bushing manufacture. O-B condenser bushings are full of them!

You can have any bushing you want on your new apparatus — *providing you express your choice.* Ask for O-B and get the highest possible dependability.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

4901-H

Contamination immunity

Continuous housings of Thorex arresters insulate destructive leakage currents from protective circuit

...without question!

Seems hard to believe, but it's true -- for the first time in lightning arrester history the dielectric strength of the porcelain housing *has been used to insulate the protective circuit!*

Heretofore, high voltage arresters have always employed stacked-unit construction. Metal caps of each unit in the stack were terminals for that unit's sensitive internal protective circuit. Surface leakage currents entered that circuit at each stack connection via this series of metallic paths. Unpredictable and, sometimes, uncontrollable voltages were thus imposed on individual units, occasionally resulting in destruction.

Today, from line to ground terminal, there is *no conductive path* from the outside to the inside of Thorex Dynagap Type MPR arresters. An inch of solid porcelain insulates and protects the sensitive internal circuit. Leakage current effects resulting from contamination are rendered harmless. Even hot washing is now routine. *Continuous porcelain housings* are the simple, positive answer.

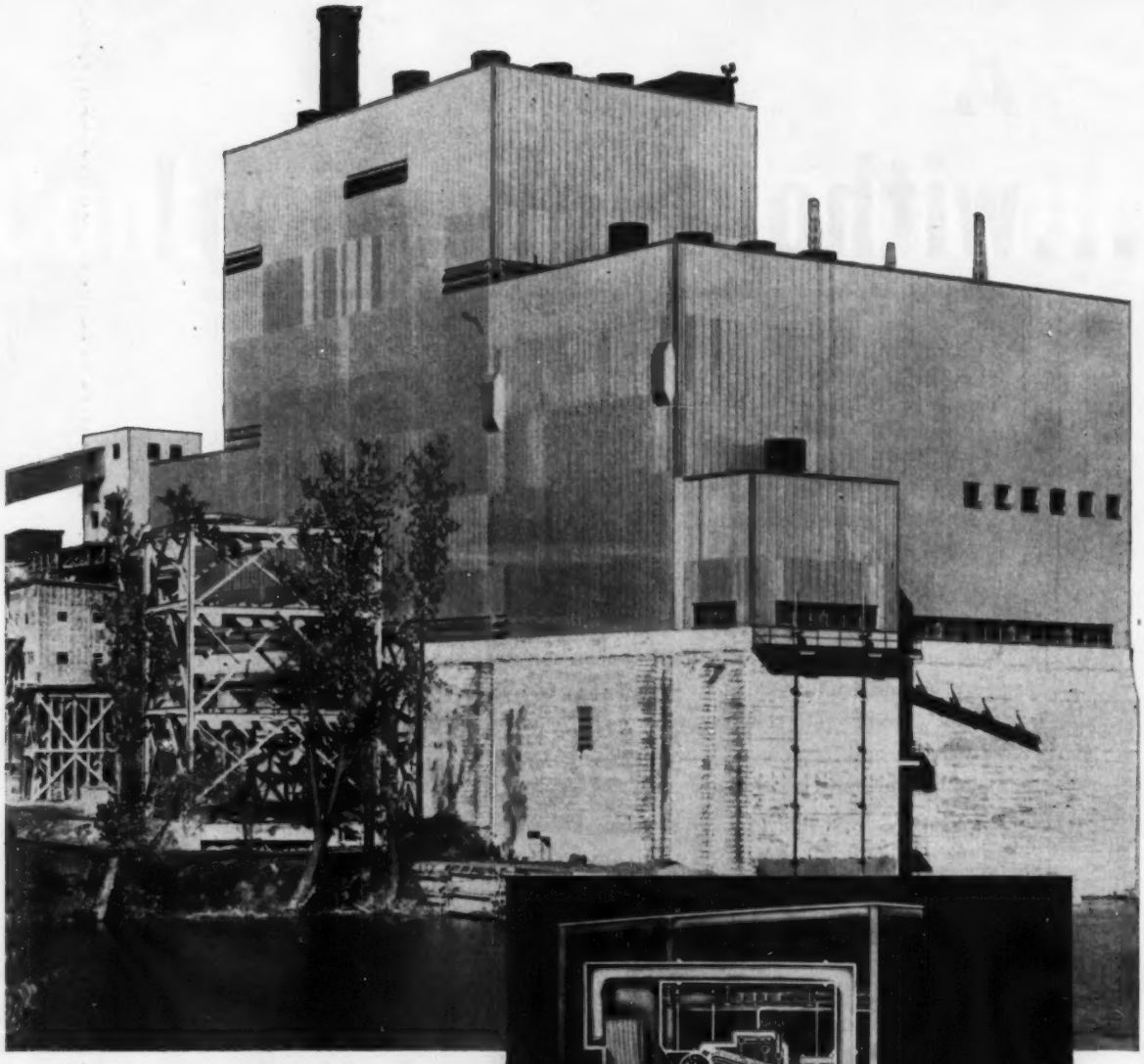
At any voltage above 69 kv -- all the way to 345 -- an entirely new order of station protection, durability, and leakage current immunity is yours when you install Thorex Dynagap lightning arresters.

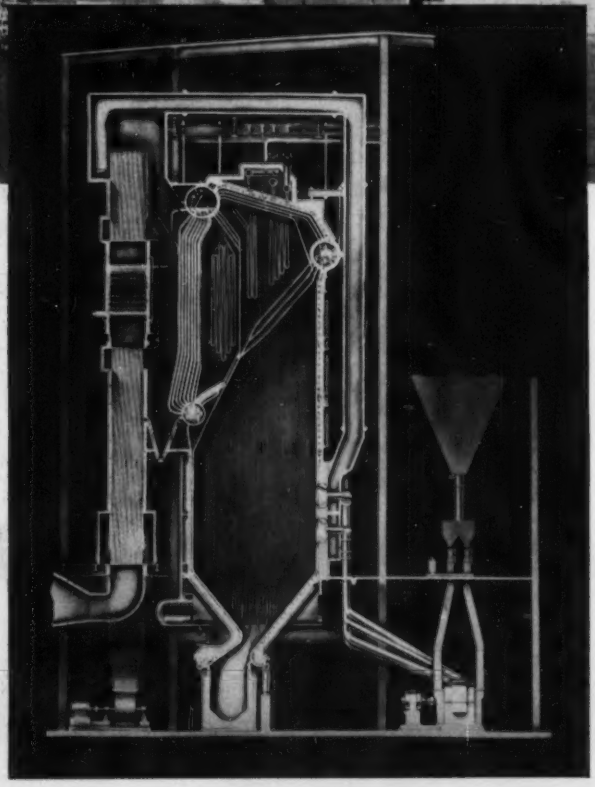
OHIO BRASS COMPANY, MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass

4909-H





Riverton Station
Northern Virginia Power Company
Riverton, Virginia

Sanderson & Porter Engineers

A survey of your plant by a qualified consulting engineer could show ways of making surprising savings in your power costs.

A Dramatic Record Of Availability At Riverton Station

Riley Steam Generating Unit gives eight years of efficient service with but ONE forced outage

Engineers of Northern Virginia Power were so impressed with the availability factor of this Riley boiler that they voluntarily advised us that since November 1950 there has been but one short forced outage, making it the best boiler in the entire system from a service standpoint.

Here is a record of performance that is proof of dependability and one of the reasons why so many public utility companies have swung to Riley in the past ten years. This boiler operates at 875 psig and 900 F. and is fired by Riley pulverizers and burners.

Today, Riley designs incorporate outstanding characteristics which meet the exacting requirements of the modern power plant. We are confident that it will pay you to investigate modern Riley designs when you are considering the installation of additional steam generating equipment. Riley engineers will gladly call on you.

RILEY STOKER CORPORATION, WORCESTER, MASSACHUSETTS

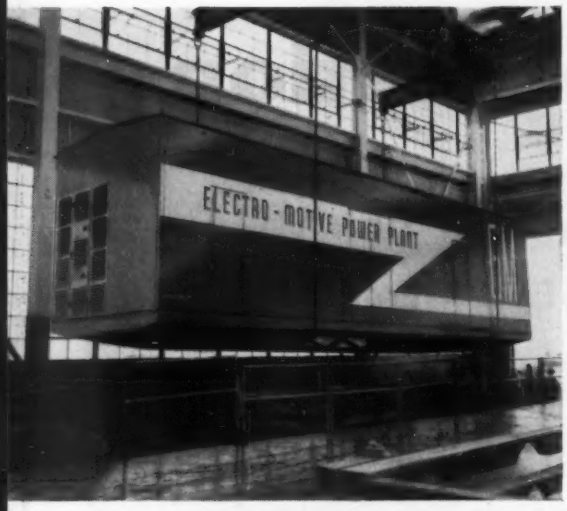
RILEY

STEAM GENERATING & FUEL BURNING EQUIPMENT

Sales Offices

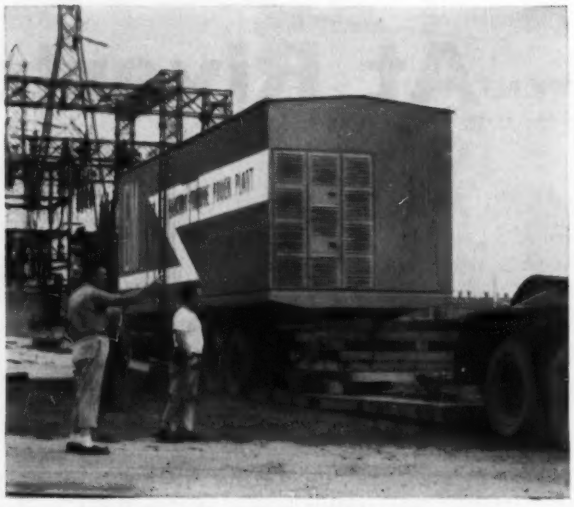
Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Jacksonville, Kansas City, Los Angeles, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Salt Lake City, San Francisco, Seattle, St. Louis, St. Paul, Syracuse, Worcester.

6000 KW PEAKING PLANT



FIRST DAY

First of three self-housed generators is placed on flat-bed trailer or rail car at Electro-Motive Plant. Unit is then hauled to installation site.

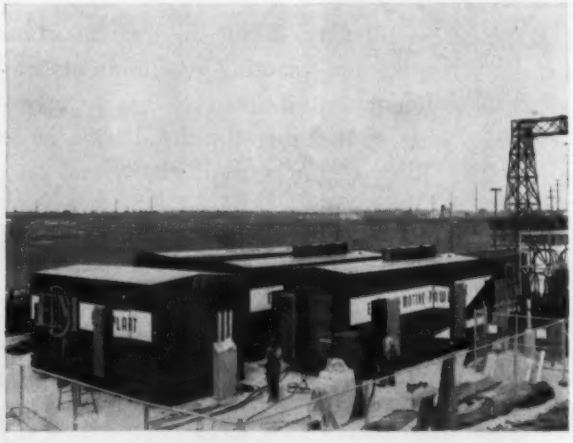


THIRD DAY

First generator arrives at site. Previously, underground fuel tanks, lines, cables were installed, ground leveled and stone fill added. Ties were then placed on fill to form foundations for plant components.

SIXTH DAY

Third generator arrives at site. Controls component and second generator were installed day before. "Package" design of all components permits easy handling with winch and jacks.



EIGHTH DAY

Adjustment and inspection. Performance tests on individual components begin. On ninth day, plant is checked out under actual load conditions, integrated into system operations. Safety fence completed.

ON THE LINE IN TEN DAYS

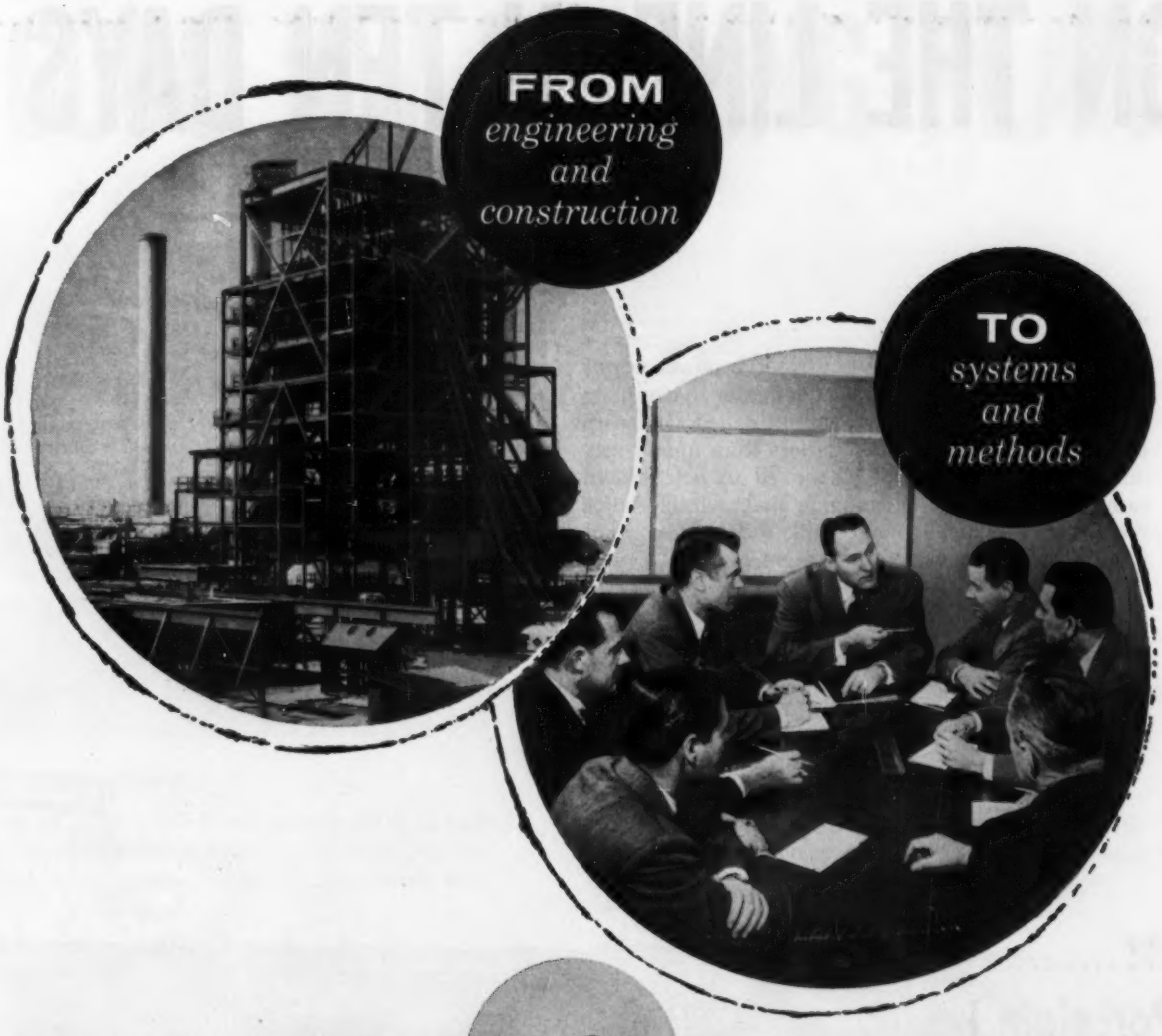
TENTH DAY

6000 KW of new peaking and reserve power is put on the line. Landscaping was added later to complete site. Plant operates completely unattended, comes up to full load from dead start in less than ninety seconds. Entire plant could be moved to new site in same ten-day period, if changing load characteristics require such a move. For complete details, contact your Electro-Motive representative.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS · La Grange, Ill.

Sales-engineering offices:
Chicago, New York, St. Louis, San Francisco

In Canada:
General Motors Diesel Limited, London, Ontario



you can count on quality performance

Sharing the same high quality of the plants Ebasco designs and builds are the many *consulting services* Ebasco offers.

One of these services—*accounting and office systems and methods*—helps companies meet the challenge of ever-increasing complications and costs in this important area of operations. An Ebasco methods improvement program can help point the way to better service and lower costs for your company. These programs are based on years of concentrated experience with companies large and small—and backed by continual research in new methods and up-to-date machine equipment.

For more information about our accounting and office systems and methods services, write: Ebasco Services Incorporated, Systems and Methods Department, Two Rector Street, New York 6, N. Y.

Challenging career opportunities are available for qualified engineers. For further information, write to our Personnel Director.

ENGINEERS · CONSTRUCTORS
EBASCO
BUSINESS CONSULTANTS

CONSULTING ENGINEERING • DESIGN AND CONSTRUCTION • FACILITIES PLANNING
FINANCIAL AND BUSINESS STUDIES • INDUSTRIAL RELATIONS • INSURANCE, PENSIONS
AND SAFETY • PURCHASING, INSPECTION AND EXPEDITING • RATES AND PRICING • RESEARCH
SALES AND PUBLIC RELATIONS • SYSTEMS, METHODS AND BUDGETS • TAX • VALUATION
AND APPRAISAL • WASHINGTON OFFICE

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...makes certain that every Porcelain Products Insulator you buy is a "carbon copy" of the proven master design

Porcelain Products Suspension Insulators are designed to meet the industry's most rigid requirements for mechanical strength, insulation, and durability. To make certain that you get these essentials in every Porcelain Products Insulator you buy—plant-wide quality control is used to check *every* process, *every* part, *every* insulator throughout the production cycle.

Quality control begins with rigid inspection of all incoming raw materials, and continues with *constant production line tests and inspections*—high and low frequency electrical tests, dimensional checks, porosity tests, combined mechanical and electrical strength tests, impact tests, thermal shock tests, radio interference tests, oil puncture tests and many others.

This complete quality control program on the production line is your guarantee that every Porcelain Products Insulator you buy duplicates the master design.

Illustration above shows insulators being given a production line 5 minute, 60 cycle shell test and a 5 second high frequency 200 KC test. The cutaway view shows construction features of Porcelain Products No. 66255 ten inch Suspension Insulator.

PORCELAIN PRODUCTS, INC. *PARKERSBURG, W. VIRGINIA*

P58-1

A SUBSIDIARY OF **A·B·CHANCE COMPANY**

High Voltage Bushings on

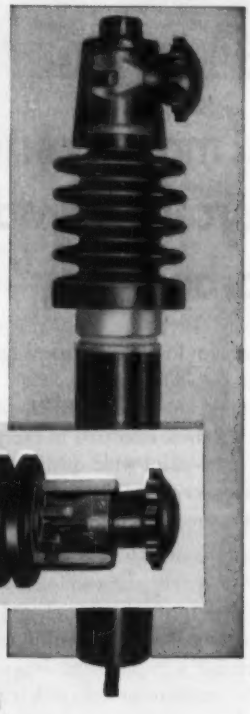
WAGNER POLE-TYPE TRANSFORMERS

ASSURE FAST, SAFE CONNECTIONS, FEWER OUTAGES!

Hand-tightening terminals and insulating terminal guards are two of many good reasons why linemen prefer Wagner Form W transformers. They find them easy to hook up, with one turn of the big easy-to-grip hand knob, and outages caused by birds and animals are practically eliminated because the terminals of both sidewall and cover mounted high voltage bushings are fully insulated.

Other features of Wagner bushings include: Heavy wet-process porcelain for protection against accidental breakage . . . all terminals key-locked in the bushing porcelain . . . sidewall bushings key-locked in the tank wall . . . all terminals take either copper or aluminum conductor . . . weather-proof and leak-proof gasketed mountings . . . bushing clamps located inside tank to eliminate unnecessary projections and guard against rusting.

The Wagner pole-type transformers on which these bushings are used—single phase 167 kva and smaller, 15 KV and below—have all the other features you want—small size, light weight, high efficiency, low impedance values, good regulation and low losses. For detailed information call the nearest of our 32 Branch Offices or write for Bulletin TU-141.



BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

6456 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U. S. A.

W7559-19

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

100,000 KW power plant addition uses
CHASE ANTIMONIAL ADMIRALTY TUBES

Workers insert first of 8,380 1" O.D. Chase Antimonial Admiralty Tubes used in power plant condenser system. This is part of company's $21,000,000 expansion program to be completed in 1960.

Chase®
BRASS & COPPER CO.
WATERBURY 20, CONNECTICUT
Subsidiary of
Kennecott Copper Corporation

There are nearly 50 miles of Chase Antimonial Admiralty Condenser Tubes in this new 100,000 KW generating unit of a prominent Southwestern power company.

Chase Antimonial Admiralty was chosen because of its favorable cost comparison as well as its enviable "in-service" record. Since Antimonial Admiralty was developed by Chase in 1935, over 125 million pounds of tubes have been put into service in thousands of installations, giving excellent service.

Chase offers unsurpassed technical assistance . . . *first-hand* technical assistance that comes from producing condenser tubes for all types of installations, including raw sea water. For details, contact your Chase representative. Or write Chase, Waterbury 20, Connecticut.

The Nation's Headquarters for Aluminum, Brass, Copper and Stainless Steel

Atlanta Baltimore Boston Charlotte Chicago Cincinnati Cleveland Dallas Denver Detroit Grand Rapids Houston Indianapolis Kansas City, Mo. Los Angeles Milwaukee Minneapolis Newark New Orleans New York (Maspeth, L.I.) Philadelphia Pittsburgh Providence Rochester St. Louis San Francisco Seattle Waterbury

New Reduced Prices For Westinghouse LTC Transformers

Save 18% on Substation Regulation Equipment Cost

A substantial price reduction for Westinghouse substation transformers with load tap changing equipment makes this apparatus an even better choice for substation voltage regulation.

This price reduction means that it is now highly advantageous to install a Westinghouse LTC transformer instead of the transformer plus three feeder-type voltage regulators.

There are many other advantages of the LTC transformer which make it today's first choice for both economy and dependability. Here are a few of those extra values:

EASIER, LESS EXPENSIVE INSTALLATION — The single-unit LTC transformer requires only one foundation, requires less interconnecting hardware, cable and disconnect switches.

COMPLETE COORDINATION — The LTC transformer provides better coordination between the transformer and regulating equipment regarding insulation levels, short circuit protection and overload capability.

STATION-TYPE STANDARDS — The LTC transformer provides station-type quality, standards and dependability. Magamp control furnishes precise regulation, with a choice of 16-step or 32-step regulation. Two or more units can be paralleled.

GREATER PROTECTION — Protection with arresters is easier and more effective with the LTC transformer. One set of bushings means less exposure risk. All windings are protected by the INSULDUR* insulation system. The 20-year warranty on contact life is your assurance of investment security on all LTC transformers, 10,000 kva and below.

Mr. Don Ralsten, Westinghouse representative, points out the economic and operating advantages of load tap changing equipment on this Westinghouse substation transformer installed on the system of a progressive midwestern utility.

BETTER NEIGHBORS — A substation site with an LTC transformer is less cluttered, improved in appearance. This, with new lower sound levels, makes these transformers better neighbors.

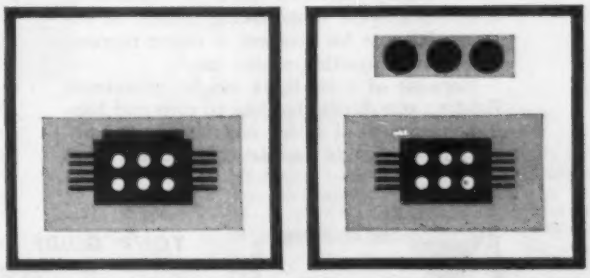
A combination of an LTC transformer for bus regulation, plus single-phase line or feeder regulators to re-regulate unbalanced feeder lines, is an ideal arrangement. This provides the highest quality service at the least possible cost.

For all the facts about the Westinghouse LTC substation transformers at the new reduced prices, call your Westinghouse representative . . . or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-70808

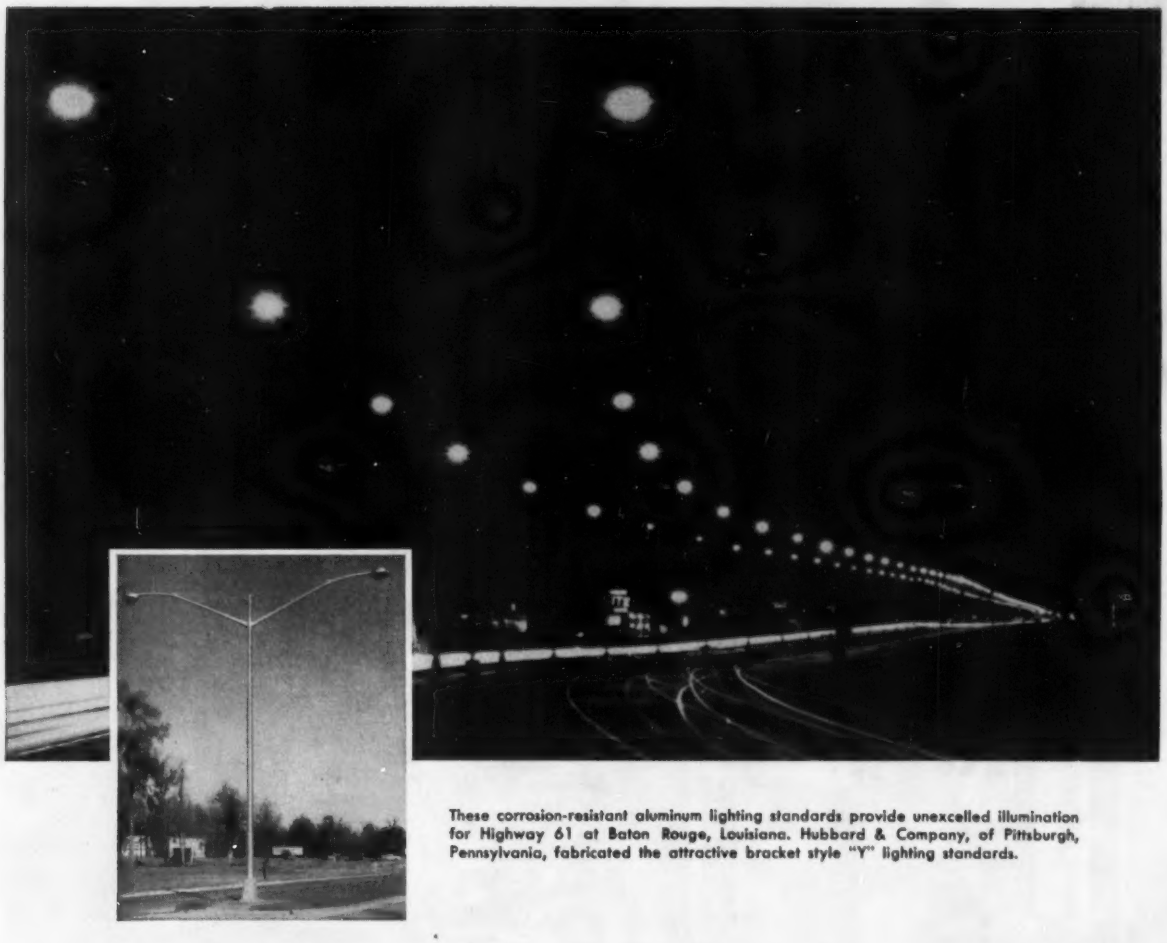
*Trade-Mark

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS



SMALLER SUBSTATION AREA — The single-unit LTC transformer occupies far less area than that required for a substation transformer with three feeder-type voltage regulators.



These corrosion-resistant aluminum lighting standards provide unexcelled illumination for Highway 61 at Baton Rouge, Louisiana. Hubbard & Company, of Pittsburgh, Pennsylvania, fabricated the attractive bracket style "Y" lighting standards.

Louisiana installs corrosion-free, maintenance-free lighting standards at no extra cost

Lighting standards of Alcoa® Aluminum are rapidly becoming the people's choice in every state of the Union. The reason? Their first cost is the last cost. Once installed, they provide years of maintenance-free service. Even under highly corrosive and moist conditions, aluminum stays new-looking longer. It can never become an eyesore; it never requires a protective coating of any kind.

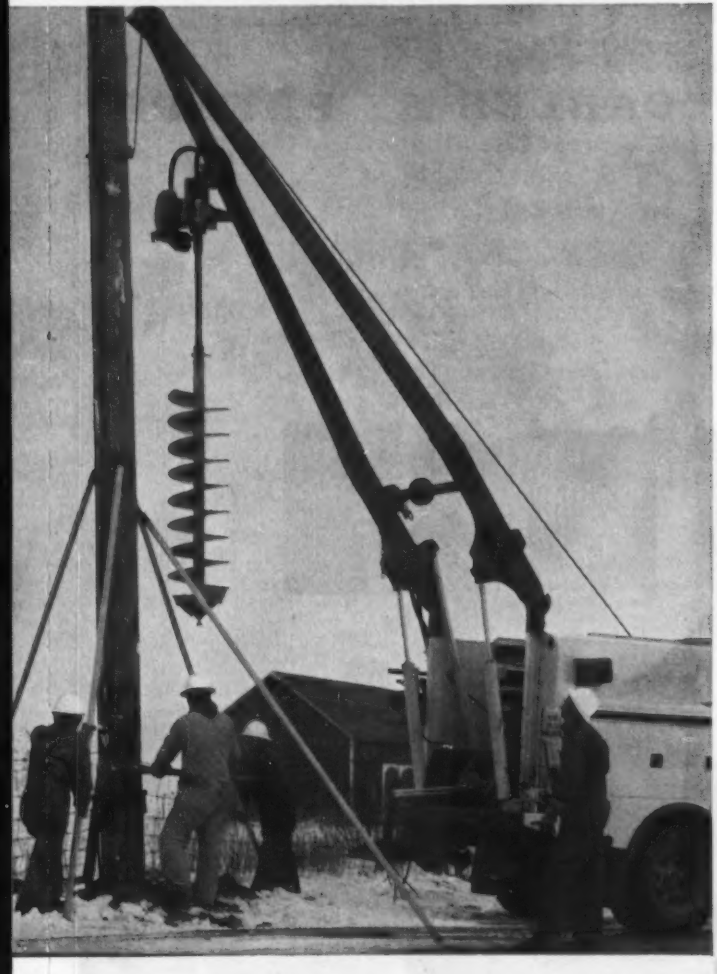
Because of their light weight, aluminum lighting standards cost less to ship and handle—they install easier and faster for additional savings in construction costs. Yet, these lightweights are heavyweights for punishment. They'll stand up in hurricane winds of 100 miles per hour and more. And, because interiors stay free from accumulations of scale, they guard electrical circuits against short circuits and service interruptions.

Alcoa does not make lighting standards, but can supply you names of manufacturers who do. For these and any additional information about lighting standards of Alcoa Aluminum, write to Aluminum Company of America, 1977-Y, Alcoa Building, Pittsburgh 19, Pennsylvania.

WE CHOSE ALCOA ALUMINUM MILL PRODUCTS ALUMINUM COMPANY OF AMERICA

YOUR GUIDE TO THE BEST IN ALUMINUM VALUE

ALCOA THEATRE
Fine Entertainment
ALTERNATE MONDAY EVENINGS



Meet the derrick that has more power in the low ranges

Holan Series 6800 Derrick gets extra power from extra cylinders

As you can see, some people have already met the new Holan Series 6800 Power Derrick—met it, used it and liked it!

They like the two sets of cylinders that give more power in the low ranges—more power for lifting, more power for forcing diggers into hard ground. They like the exclusive dial load-indicator to quickly show capacity in any position. They like Holan's lighter-but-stronger fabricated, rectangular side legs. And they like live-boom action with a single-drum winch.

The 6800 handles 8,000 pounds . . . sets 65-foot poles . . . body-loads 4,000 pounds . . . and lifts 2,000 pounds when only 5½ feet from the ground. To learn some more facts, meet the man who can tell you all about it, a Holan Field Representative. Call or write.

OTHER EQUIPMENT IN THE PHOTO:

Series 4095 Hydraulic Jacks, self-stowing, move to full extension in 8 seconds, return to stowed position in 6 seconds. 14,000-pound capacity.

Body is CMC-164. All Holan bodies are made of hi-tensile, rust-resistant steel 20 to 25% lighter than ordinary steels.

Series 4401-H Hydraulic Earth Borer digs holes 8″ to 20″ wide, 8 feet deep. Power feed attachment in photo uses weight and power of derrick to force digger into ground. Note that hydraulic lines from digger in photo run along side leg instead of hanging loose.

J.H. HOLAN CORPORATION

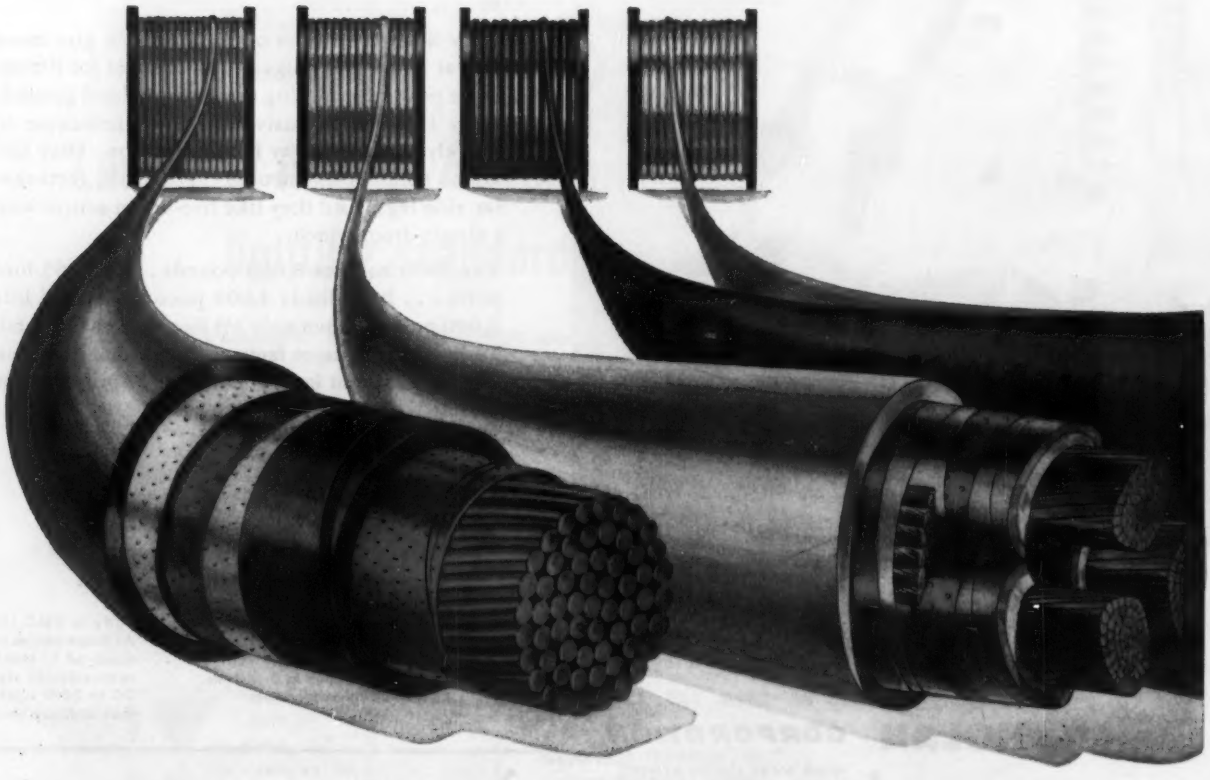
4100 WEST 150TH STREET
CLEVELAND 35, OHIO

OTHER PLANTS: HOLAN CORPORATION OF GEORGIA, Griffin, Ga.
J. H. HOLAN CORPORATION, PHOENIX DIV., Arizona
BRANTFORD-HOLAN LIMITED, Brantford, Ontario

THE NAME THAT MEANS WORK SIMPLIFICATION

FOR THE MOST EFFICIENT
POWER DISTRIBUTION . . . SPECIFY

PAPER-INSULATED CABLES BY PHELPS



Single conductor, 1 KV and up

Three-conductor, 1 KV and up

DODGE!

Phelps Dodge paper-insulated power cables have a *demonstrated record* of long life in a great variety of designs for all types of applications—underground duct, direct burial, submarine and aerial.

Paper-insulated cables have these important inherent characteristics that improve operating performance and lengthen service life:

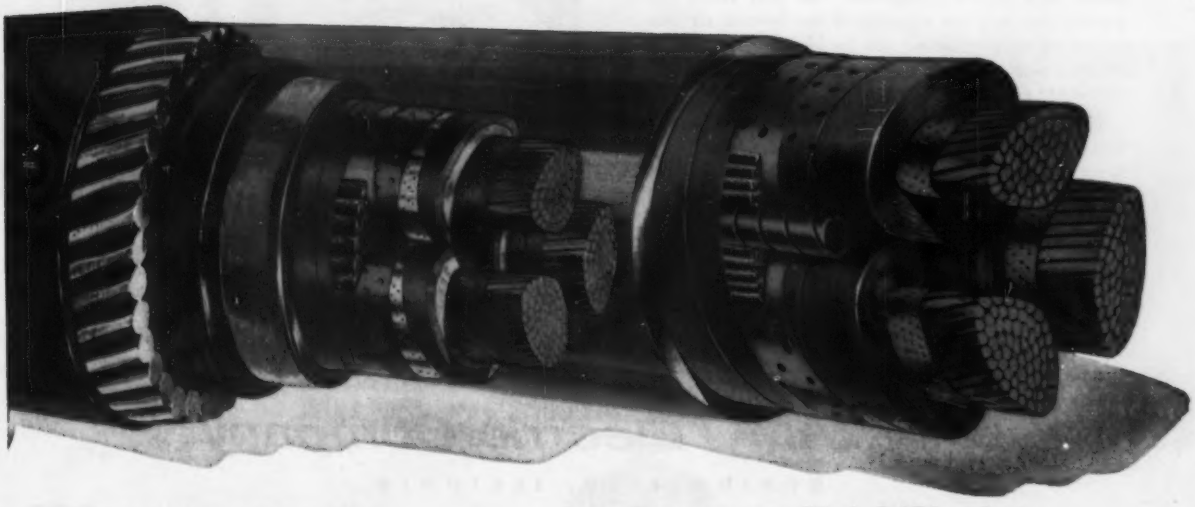
- Extra high 60-cycle and impulse strength to withstand switching and lightning surges.
- Ability to handle large blocks of power in single cables of minimum dimensions.
- Positive protection against all contaminations, due to being hermetically sealed in an extruded metallic sheath.

Paper-insulated cables can be supplied with either lead or aluminum sheaths.

Phelps Dodge offers the widest range of high voltage cables to the electrical industry.

PHELPS DODGE COPPER PRODUCTS CORPORATION

300 PARK AVENUE, NEW YORK 22, NEW YORK



Submarine, 1 KV and up

Low-Pressure gas-filled, 8 KV and up

ACKNOWLEDGED LEADERSHIP IN DEMAND MEASUREMENT

Install Lincoln Type PW on growing loads

This new polyphase Lincoln watt demand/watt-hour combination meter is your logical choice for installations where future load growth is expected. The dual range feature permits changing the capacity of the demand element in service by simply moving two readily accessible link connections and interchanging the demand scales. Recalibration is not necessary after the changeover.

Class 100 Type PW Meters are available with dual demand ranges of 24 and 48 kw, and Class 200 with ranges of 48 and 96 kw. Meters are also available with universal scales and multiplier plates marked according to the selected range.

Ask your Sangamo Representative, or write for full information about the many advantages these compact, versatile Lincoln demand meters can offer.

A screwdriver is the only tool needed to change the range. Just move the links from "L" to "H" to increase range and interchange the doweled scale plate.

SANGAMO Electric Company

SPRINGFIELD, ILLINOIS

SM58-7

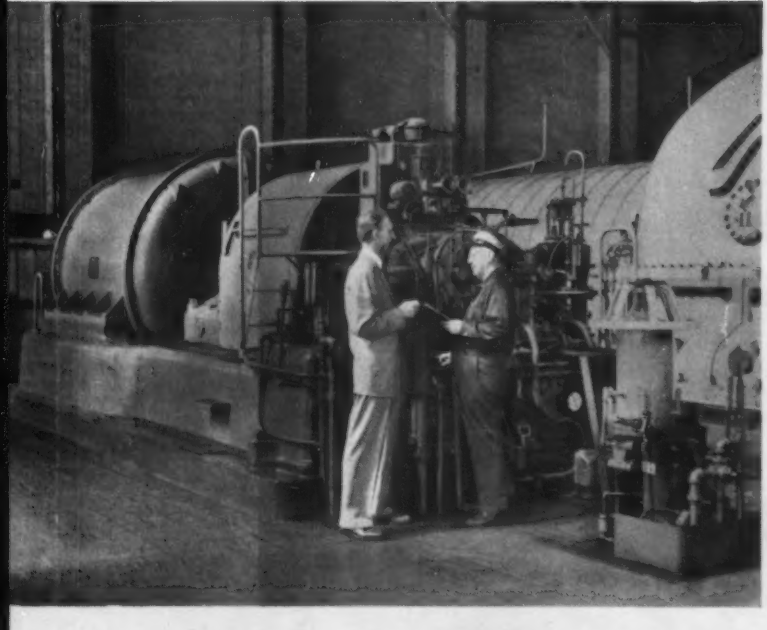
Report from Wisconsin Electric Power Company

HOW THE ONLY OIL WITH LIFE-OF-TURBINE GUARANTEE IS DOING AFTER 27 YEARS

Situation: On February 23, 1931, Wisconsin Electric Power started Turbine 12 at its Lakeside Station – a 7,700 kw. General Electric. The 550-gallon turbine oil reservoir was filled with NONPAREIL. A Standard Oil lubrication engineer was there to supervise the fill. After 30 days a framed certificate was furnished the utility. This certificate guaranteed that the NONPAREIL Turbine Oil would never exceed a level of acidity of 0.15 mg. KOH/g. for the life of the turbine.

What has happened: Analyses of oil samples have been made at regular intervals since the start-up date. The acidity level of the oil now is the same as the day it went into service –0.06 mg. of KOH per gram of oil. In the 27 years since NONPAREIL Turbine Oil was installed, Wisconsin Electric Power has added steadily to its generating capacity. NONPAREIL Turbine Oil has been installed in all turbines.

What to do: Get more information about NONPAREIL from your nearby Standard Oil industrial lubrication specialist in any of the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), Chicago 80, Illinois.**



Standard Oil's Robert A. Guis and Lakeside Station superintendent, C. E. Thielman, inspect records of Turbine 12, which has been operating with NONPAREIL Turbine Oil for 27 years. Years of experience providing technical service and an engineering degree qualify Bob Guis for work with utilities on turbine lubrication. Bob has an engineering degree from the University of Wisconsin plus 18 years of this kind of work behind him. In addition, he has completed the Standard Oil Sales Engineering School.

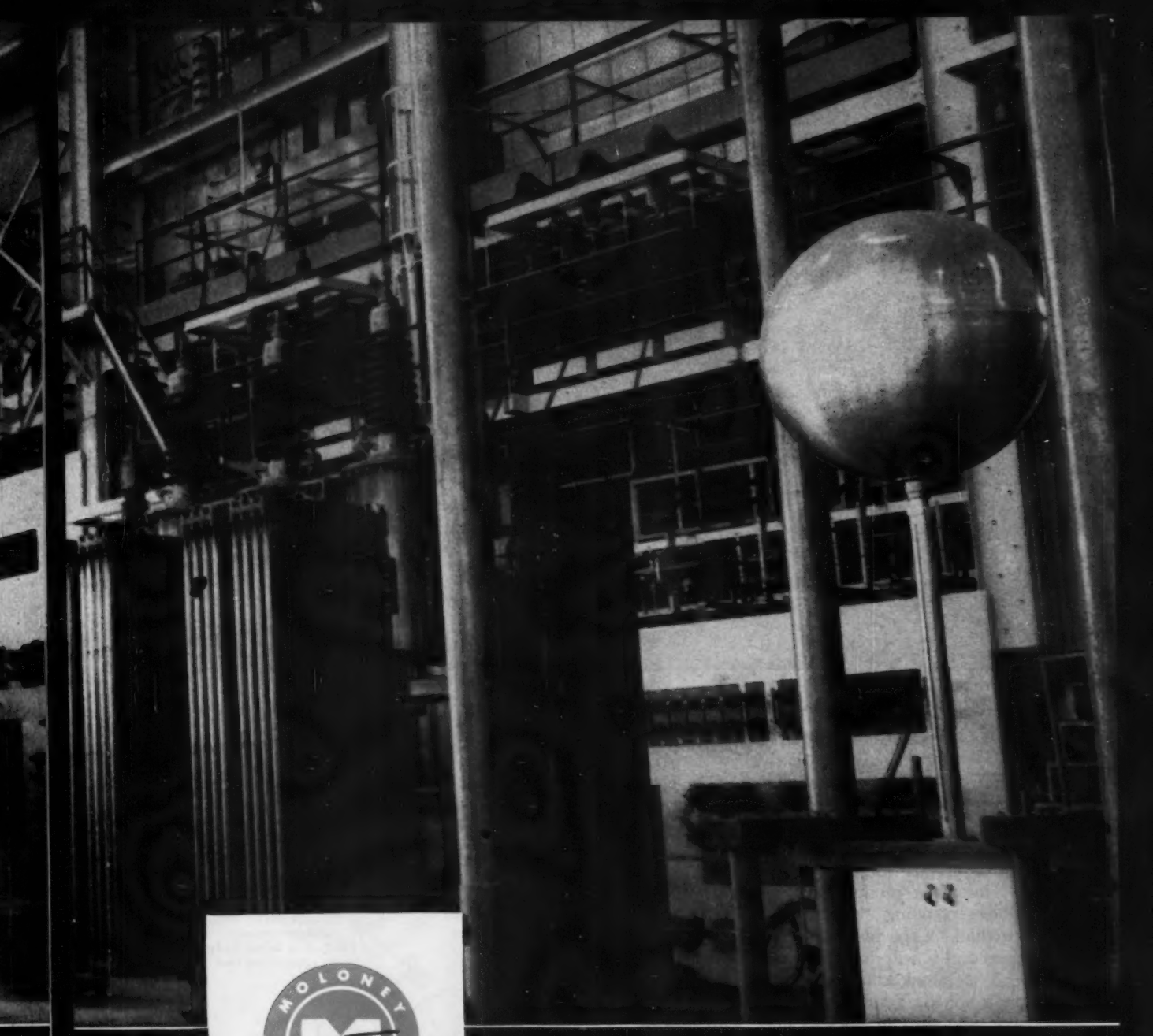
Quick facts about

NONPAREIL Turbine Oil

- Will not permit formation of harmful acids
- Will not permit formation of sludge or oil varnish
- Will maintain good demulsibility or water separating characteristics
- Has high resistance to foaming
- Contains adequate rust inhibitor

You expect more from STANDARD and get it!

PROVING GROUND



The "Proving Ground" for Moloney Power Transformers is this large, fully-equipped test area suitable for testing the largest of transformers.

Each Moloney Power Transformer undergoes thorough tests to prove that it meets industry standards and Moloney's high standards of quality and performance.

Thus, the test bay shown here can aptly be called the proving ground for future performance . . . the payoff of constant research and development programs.

Specify power transformers that are designed, built and proven to give efficient, dependable performance . . . Specify Moloney Transformers. All Along The Line.

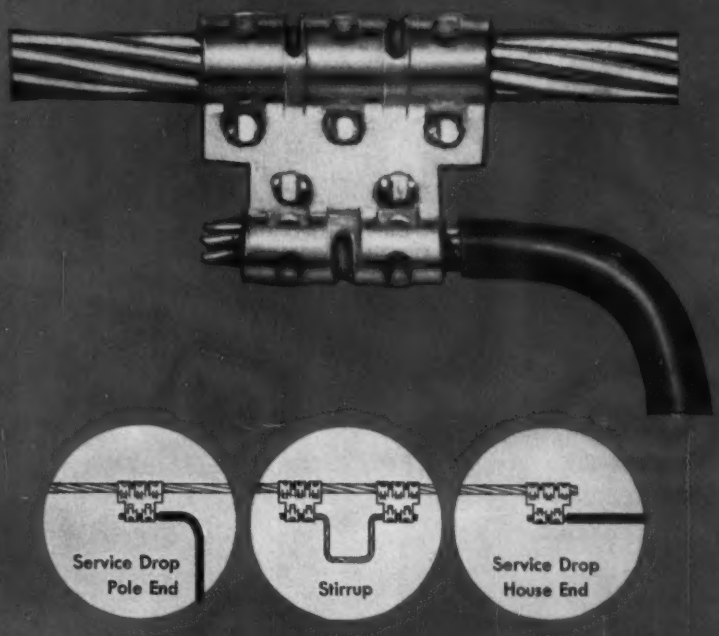
MC-58-27

MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

The TAP that TOPS them all...



THE MULTI-PURPOSE AMP UTILI-TAP®
for aluminum and/or copper conductors

Tired of all the expensive clutter in your stock rooms—a special tool for this, a special piece of hardware for that? Now you can clear out a lot of your inventory clutter with all new A-MP UTILI-TAP®.

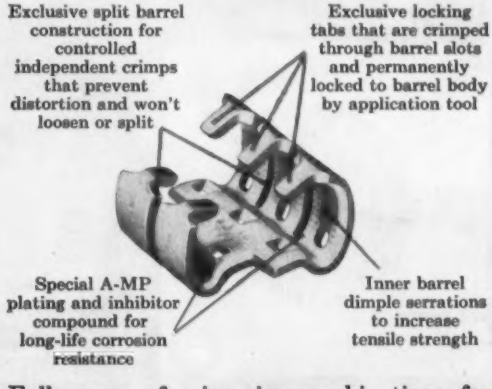
Here is a product that can be used on diverse tapping installations—like no other product on the market. It's permanent, it's sure and it will do many, many jobs.

Your stock can be simplified and easily maintained. Your linesmen can now go up the pole without pockets filled with miscellaneous parts or belts loaded with special tools. Simplify with the A-MP UTILI-TAP®.

Light-weight matched tooling available in mechanical or hydraulic types.

The only tap on the market that converts from an easily attached open barrel construction to a permanent, closed barrel attachment.

Look at these unbeatable features:


Exclusive split barrel construction for controlled independent crimps that prevent distortion and won't loosen or split
Exclusive locking tabs that are crimped through barrel slots and permanently locked to barrel body by application tool
Special A-MP plating and inhibitor compound for long-life corrosion resistance
Inner barrel dimple serrations to increase tensile strength

Full range of wire size combinations for aluminum, copper or ACSR conductors.

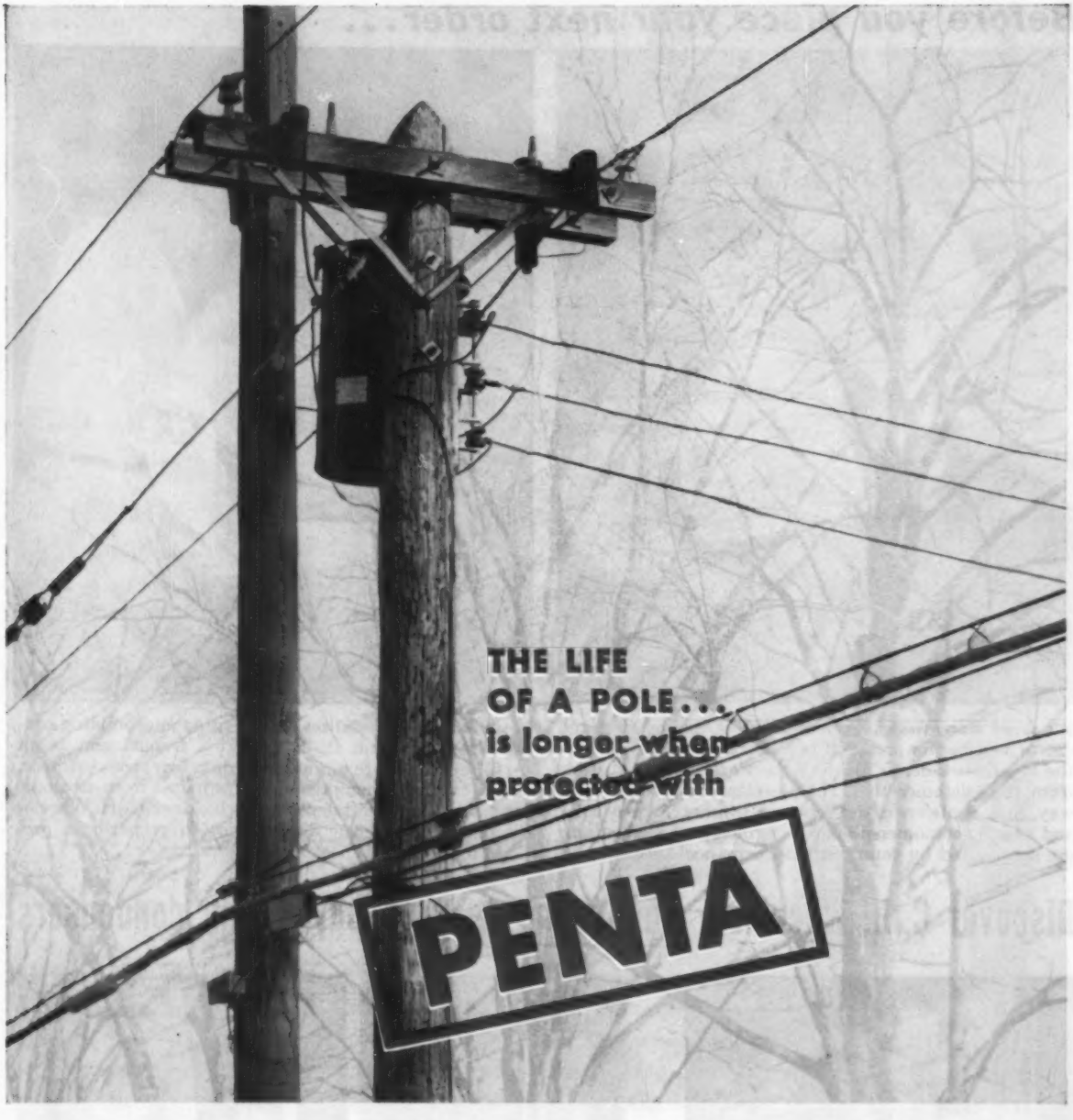
Send today for more information to solve your tap inventory and reliability problems simultaneously.

American Pamcor, Inc.

api AMERICAN PAMCOR INC.

GENERAL OFFICES: 181 HILLCREST AVE., HAVERTOWN, PA.

Exclusive Distributor For AMP Products To The Utility Industry



Today, more and more men with maintenance on their minds will tell you . . . it's good business to protect lumber with PENTA treatment. Here's why:

1. Costs no more — Service records show PENTA treatment gives poles, cross ties and other lumber for exposed structure extra long life. Yet PENTA treatment costs no more than ordinary preservatives.

2. Won't leach out — Because PENTA is an oil-borne rather than water-soluble preservative, it doesn't leach out, leaving wood vulnerable to rot and termites.

3. Clean to handle — Construction and maintenance supervisors know that workmen handle clean wood faster, more efficiently — and with fewer kicks!

Reichhold is a major supplier of PENTA to the wood industry and to wood users. If you haven't done so yet, investigate this modern method of protecting your lumber investments — write for the name of your nearest Reichhold distributor of PENTA.

REICHHOLD

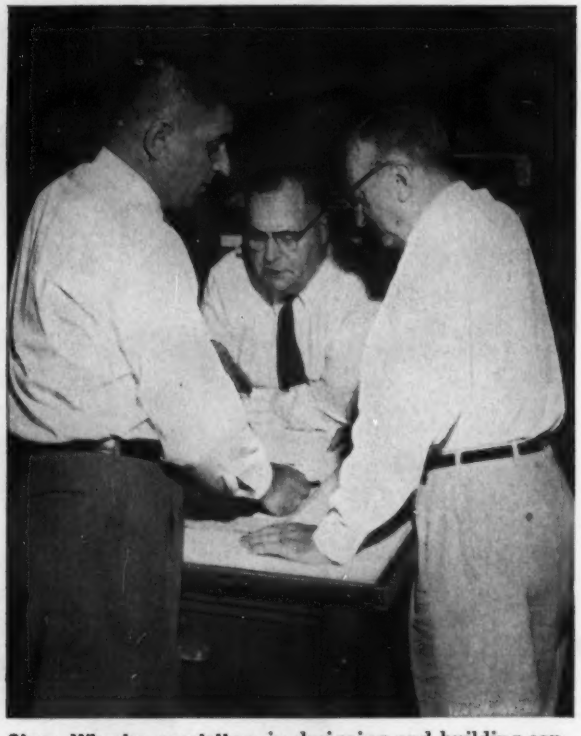
Synthetic Resins • Chemical Colors • Industrial Adhesives • Phenol
Hydrochloric Acid • Formaldehyde • Glycerine • Phthalic Anhydride
Maleic Anhydride • Sebacic Acid • Ortho-Phenylphenol • Sodium Sulfite
Pentaerythritol • Pentachlorophenol • Sodium Pentachlorophenate
Sulfuric Acid • Methanol

REICHHOLD CHEMICALS, INC.,
RCI BUILDING, WHITE PLAINS, N.Y.

Creative Chemistry . . . . . Your Partner in Progress

Before you place your next order...

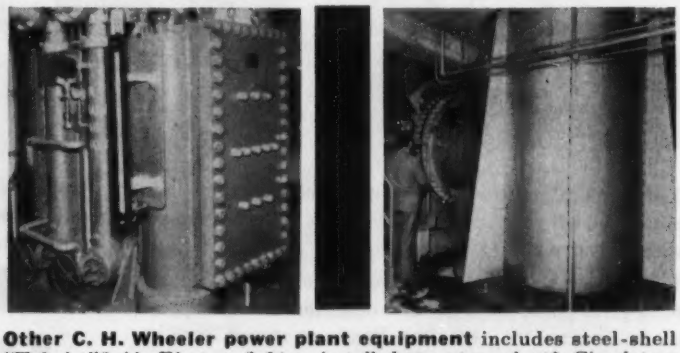
It's saved many weeks, even months of engineering and executive time for scores of power companies! Basically, the idea is to shift as much of the work load as possible from the customer to C.H. Wheeler. By working this way, long conferences are replaced by short phone calls, and lengthy customer-prepared engineering specifications are supplanted by thumbnail performance sheets.



Since Wheeler specializes in designing and building condensing equipment, its Engineering Department is set up to take this bare minimum of data from the customer, and work up a comprehensive proposal from it alone. Here you see several department heads of C. H. Wheeler discussing engineering design prior to preparing a proposal for a C. H. Wheeler client.

Discover C. H. Wheeler's time-saving way to buy steam condensers

We often save clients up to 4 months' time by sending Wheeler engineers to work "on the board" at clients' offices, instead of mailing drawings for approval. Above is a typical installation—a 105,000 sq. ft. Dual Bank Divided Water Box Unit, installed at a New York station.* It condenses 950,000 lbs. steam/hr.



Other C. H. Wheeler power plant equipment includes steel-shell "Tubejet"® Air Ejectors (left) as installed at eastern plant*, Circulators (right) which in the same plant deliver 86,500 gpm water, and Condensate Pumps. See your representative or write for details on the time-saving way to buy Dual Bank Surface Condensers and other power equipment.

**Names of these and other power stations equipped by C.H. Wheeler supplied on request.*

C. H. Wheeler Mfg. Co.

19TH & LEHIGH AVENUE Philadelphia 32, Pennsylvania

Steam Condensers • Vacuum Equipment • Centrifugal, Axial and Mixed Flow Pumps • Marine Auxiliary Machinery • Nuclear Products

You can replace *any* draw-lead bushing on your 69 kv system

with one of these LAPP POC* BUSHINGS!

Here's a real saving for you in simplification of warehouse inventories and reduction of costs! No matter how many types of transformers may be on your system . . . no matter how old they may be . . . any bushing replacement requirement can be met by the Lapp POC* ASA Standard bushing.

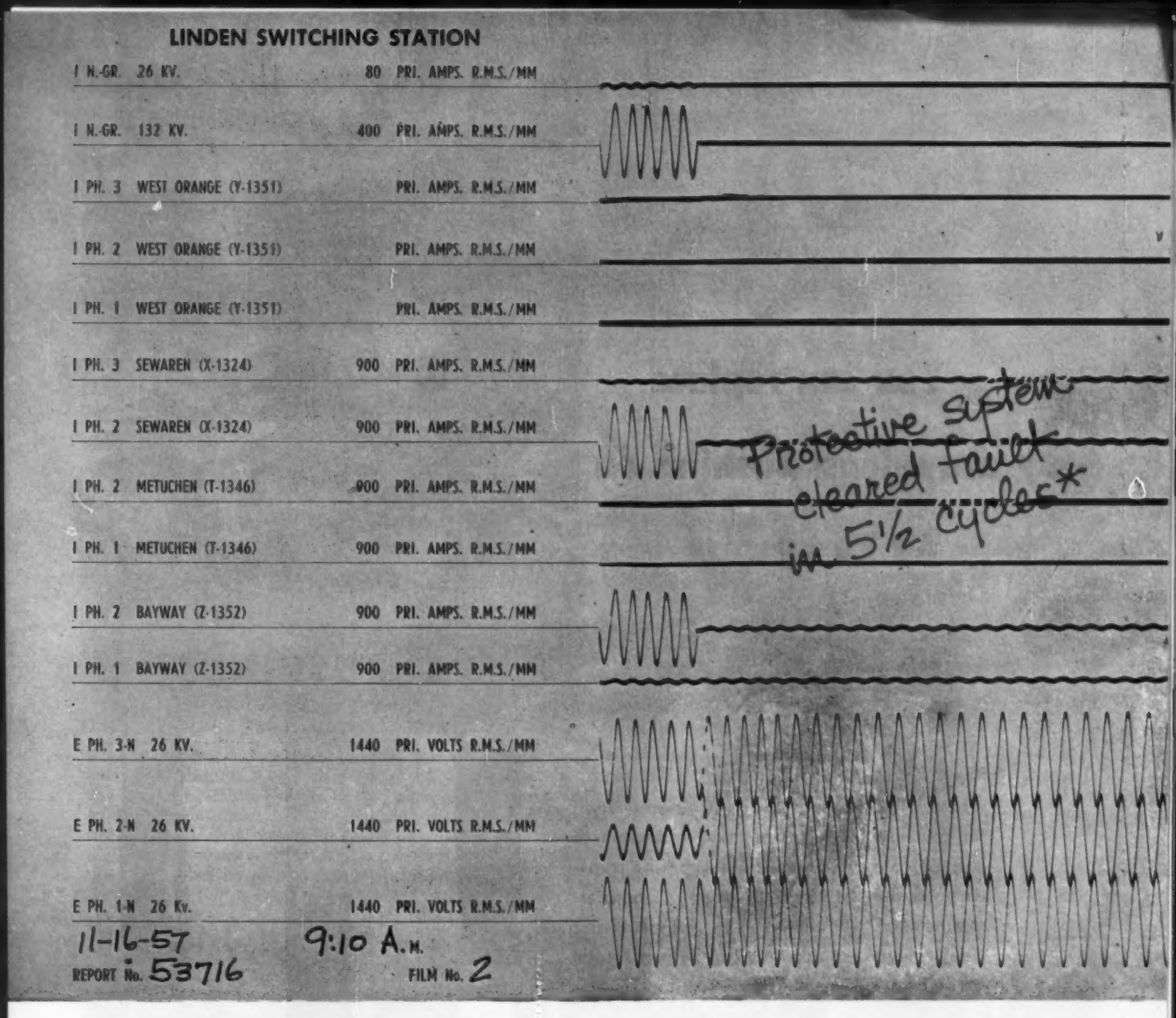
At 69 kv, for example, the Lapp POC* draw-lead (400 amp) bushing is made in just three shank lengths. Present transformer designs call for these bushings. On any older transformer using a pre-standard bushing, one of these will also fit perfectly; all that is required is a simple flange adapter which provides for differences in mounting details, and for length and clearances.

Lapp can supply POC* Bushings for your stand-by stocks in voltage ratings 15 kv to 161 kv. Also, we'll design and supply, at nominal cost, non-magnetic flange adapters which will adapt these ASA Standard bushings to every transformer on your system. Give us data on the transformer bushings you now have in service. Let us show you the economies you can effect by reducing your entire stock of spare bushings to the required sizes of Lapp POC* Bushings and a suitable assortment of flange adapters. You'll never be without the replacement bushing you need, and you will save spectacularly in warehouse space . . . in stock maintenance labor costs . . . in investment in inventory. Lapp Insulator Co., Inc., Le Roy, New York.

Lapp

POC* BUSHING

*PAPER-OIL CONDENSER TYPE
TOTALLY-ENCLOSED CORE
ASA STANDARD


LINDEN SWITCHING STATION
I N.-GR. 26 KV. 80 PRI. AMPS. R.M.S./MM
I N.-GR. 132 KV. 400 PRI. AMPS. R.M.S./MM
I PH. 3 WEST ORANGE (Y-1351) PRI. AMPS. R.M.S./MM
I PH. 2 WEST ORANGE (Y-1351) PRI. AMPS. R.M.S./MM
I PH. 1 WEST ORANGE (Y-1351) PRI. AMPS. R.M.S./MM
I PH. 3 SEWAREN (X-1324) 900 PRI. AMPS. R.M.S./MM
I PH. 2 SEWAREN (X-1324) 900 PRI. AMPS. R.M.S./MM
I PH. 2 METUCHEN (T-1346) 900 PRI. AMPS. R.M.S./MM
I PH. 1 METUCHEN (T-1346) 900 PRI. AMPS. R.M.S./MM
I PH. 2 BAYWAY (Z-1352) 900 PRI. AMPS. R.M.S./MM
I PH. 1 BAYWAY (Z-1352) 900 PRI. AMPS. R.M.S./MM
E PH. 3-N 26 KV. 1440 PRI. VOLTS R.M.S./MM
E PH. 2-N 26 KV. 1440 PRI. VOLTS R.M.S./MM
E PH. 1-N 26 Kv. 1440 PRI. VOLTS R.M.S./MM
Protective system cleared fault in 5½ cycles*
11-16-57 9:10 A.M.
REPORT No. 53716 FILM No. 2

A pothead failed . . .

RECORD ENDS GUESSWORK AS TO OPERATION OF PROTECTIVE SYSTEM

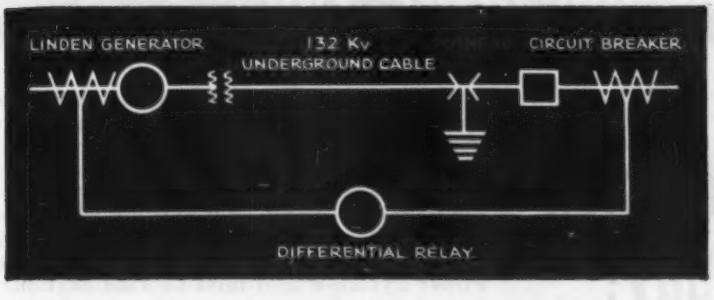
This is the record made by a Hamilton RS-9 Automatic Oscillograph when a pothead failed at the Linden Generating Station of the Public Service Electric and Gas Co., Newark, New Jersey.

Analysis of the record shows that failure was from phase 2 to ground; and that the fault was located at a pothead on the underground cable carrying 132 KV, connecting the 450,000 KW capacity power plant to the switching station.

Most important, the record shows that the breakers of the high speed differential protective system cleared the fault within 5½ cycles—providing complete assurance that the protective system operated as designed, saving possible outage, damage and loss of revenue.

The Public Service Electric and Gas Co. has several Hamilton RS-9 Automatic Oscillographs standing by, monitoring their system. Within 2 milliseconds after a fault occurs, an instrument is automatically at work, making a permanent record of the transient wave forms. The time and date of the fault are recorded. Then, after the fault has cleared, the oscillograph stops and automatically resets itself to record the next fault.

The RS-9 provides an accurate record of the sequence of operation of a protective system of relays and breakers, ending time-consuming, inconclusive guesswork. It can provide assurance that the protective system is operating properly...that generators, large power transformers and transmission line facil-

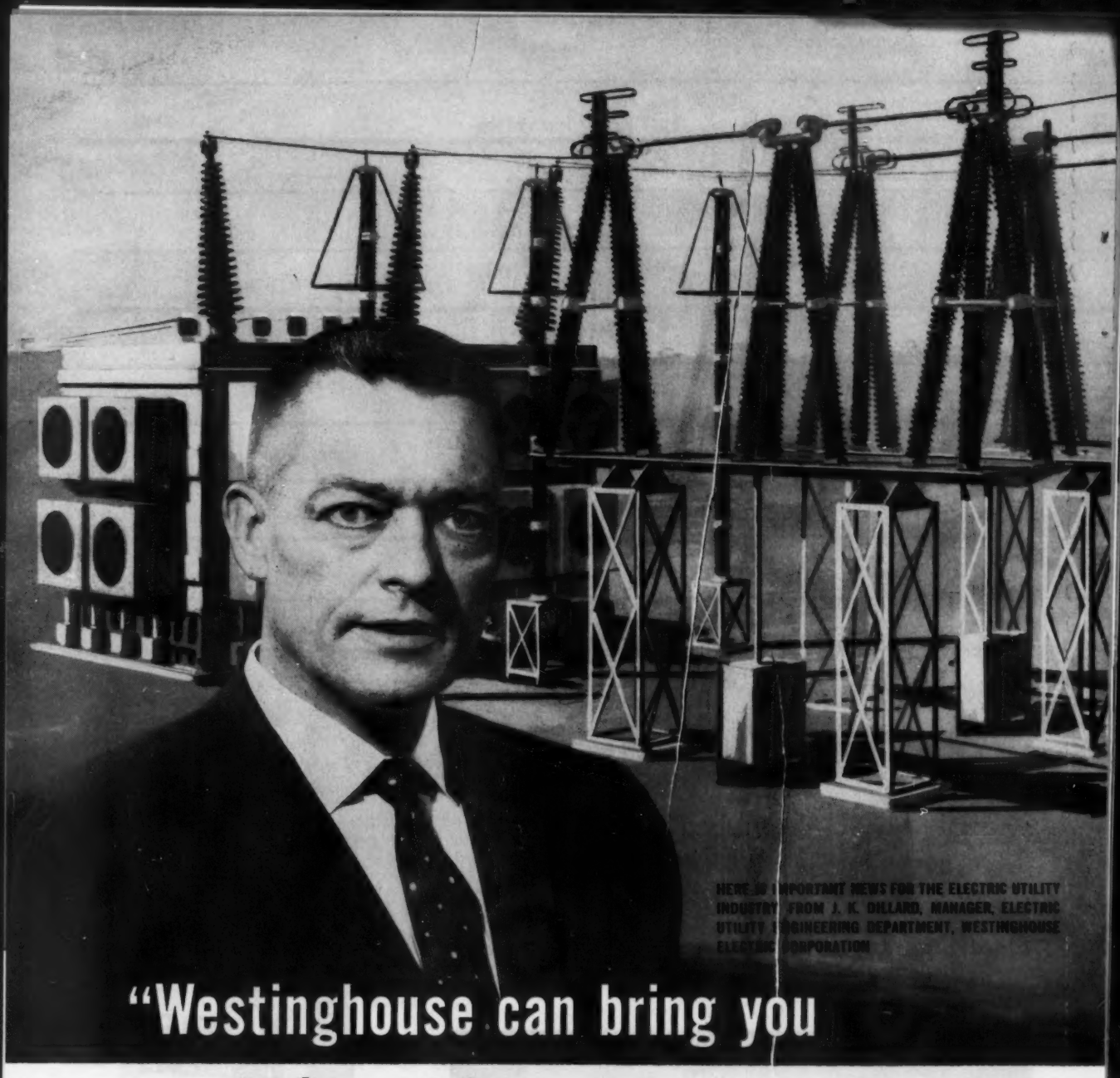


ities are fully protected. And it can warn of the malfunctioning of protective equipment before damage is caused.

There are two models of the Hamilton RS-9 Automatic Oscillograph. The RS-9 Fourteen has 14 channels for recording information. The RS-9 Thirty has 32 channels, providing a system with the extra capacity required in future years as the system becomes more complex.

For complete information about the RS-9 Automatic Oscillograph, write: Hamilton Watch Company, Hathaway Instrument Division, Denver, Colorado.

HAMILTON WATCH COMPANY
HATHAWAY INSTRUMENT DIVISION
5800 East Jewell Avenue Denver 22, Colorado



HERE IS IMPORTANT NEWS FOR THE ELECTRIC UTILITY INDUSTRY FROM J. K. DILLARD, MANAGER, ELECTRIC UTILITY ENGINEERING DEPARTMENT, WESTINGHOUSE ELECTRIC CORPORATION

"Westinghouse can bring you equipment for 600-kv transmission systems—today!"

Westinghouse can design and build apparatus for extra-high-voltage systems . . . now! These are the facts:

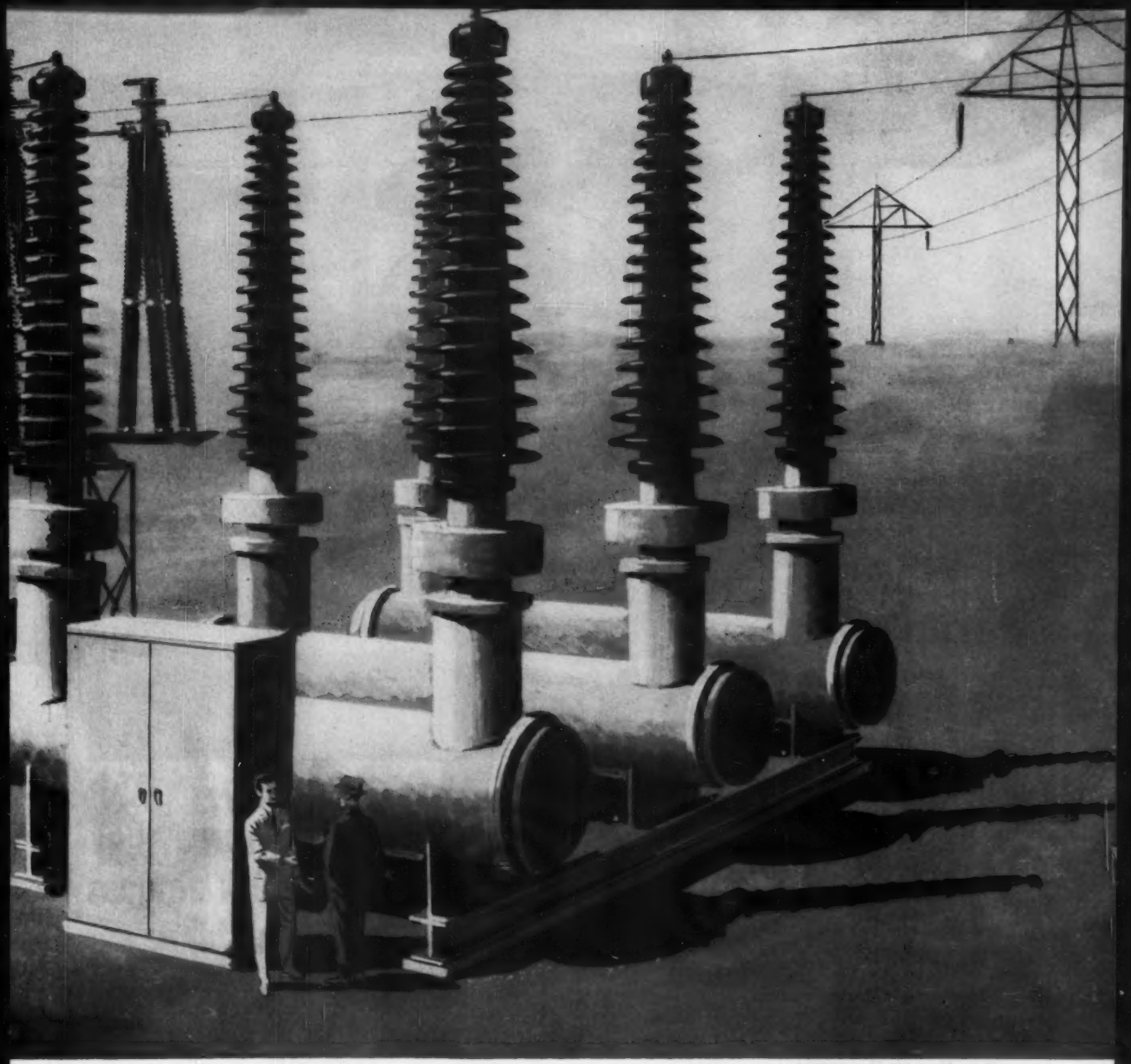
Ability to supply this equipment is completely dependent upon basic understanding of system behavior at such voltages. This knowledge has been acquired by exhaustive tests conducted in cooperation with the electric utility industry.

Building blocks of today's E-H-V knowledge . . . Tidd project and high-altitude tests at Leadville

Westinghouse gained early E-H-V experience in 1947 by building transformers for the American Electric Power System's field tests at Tidd Station. All operating conditions that could reasonably be expected were simulated, including surge voltages up to 2250 kv. Based on this experience, 345-kv apparatus . . . power circuit breakers, transformers, arresters, disconnect switches . . . is in successful commercial operation on hundreds of miles of 345-kv circuits.

An advanced laboratory in the Rockies

In 1956, in cooperation with Public Service Company



of Colorado, Westinghouse began participating in a broad investigation of E-H-V transmission in the Rocky Mountains. This project includes measurement of corona and radio influence and exhaustive switching surge experiments. Conductor size and bundling effects, reduced insulation levels and economics of super-voltages are being studied as a further extension of Tidd tests at 10,000-ft altitudes under violent extremes of weather and temperature changes.

Spending millions to save utilities tens of millions

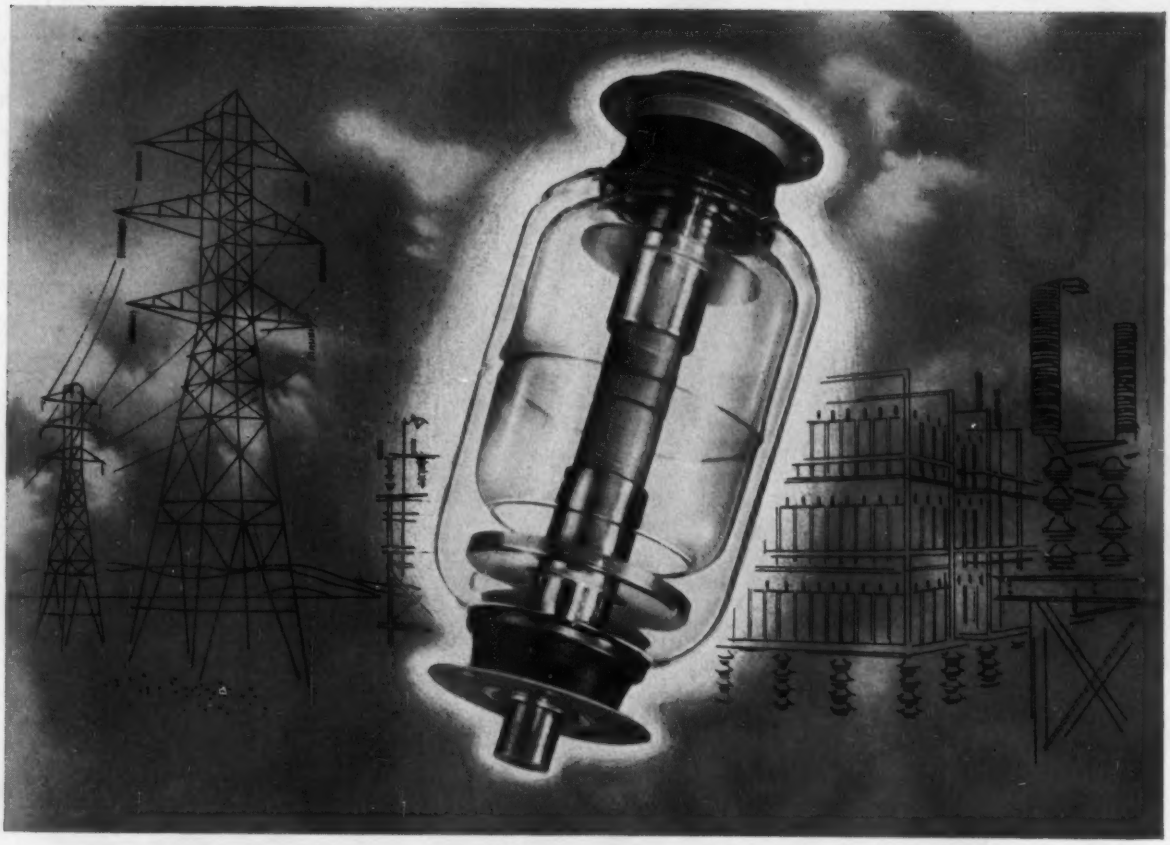
Building upon this field experience, and many successful commercial applications at 345 kv, apparatus has been further developed at modern test centers throughout Westinghouse—complete high-voltage, high-power test facilities allowing the development of equipment for 600-kv systems.

The concept of an E-H-V system was tackled 11 years ago. Westinghouse—and the industry—now knows that in seven years enough generating capacity will be added to power another America. To distribute this power economically—to distribute it at all—will require super-voltage systems. For 460-kv or 600-kv systems, Westinghouse is ready today to furnish equipment to do the job. J-97211

Because of the Westinghouse policy of plowing back earnings into the future of the electric utility industry, the challenge of 600-kv transmission systems has been met!

YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS



REVOLUTIONARY NEW POWER SWITCH

featuring... VACUUM!

The success or failure of any power switch depends on the strength and all-around efficiency of its dielectric. Over 17 years of research and development by Jennings Radio Manufacturing Corporation plus hundreds of installations in the power field prove that a vacuum has no rival as an interrupting medium. Here are the reasons:

A vacuum dielectric is 30 times stronger than air. In fact, contact openings of only 1/32 inch will hold off over 100,000 volts because practically no molecules remain to be ionized.

A vacuum dielectric is also characterized by extremely rapid recovery in dielectric strength because the vaporized contact material which carries the current diffuses very rapidly into the surrounding vacuum. Therefore, 60 cycle power circuits are always interrupted at the first current zero.

These facts have been recognized for years but now Jennings has developed unique processing methods that make a vacuum dielectric practical in power switches. These techniques insure a stable vacuum wherein contacts and vacuum seals will not break down even though subjected to enormous abuse over a long period of time.

Unusually long contact and vacuum life is assured by these cleaning and outgassing techniques. Low energy arcs reduce erosion of contacts and vacuum actually improves with repeated current interruption. This incredibly clean vacuum also permits the use of contacts made of refractory metals with high resistance to welding.

Vacuum switch installations for capacitor switching, line dropping, load break, and circuit breaker applications are now being made by switchgear manufacturers using Jennings' vacuum switch contacts. We have prepared literature describing the ten sizes now available for power use. Send for your copy.

Jennings RADIO MANUFACTURING CORP. • 970 McLaughlin Ave., P. O. Box 1278 • San Jose 8, Calif.

Ask for it

IF YOU EXPECT TO GET IT

Your own company records will justify the slight extra trouble of specifying "O-B" on switchgear purchases

Manufacturers of switchgear and package substations are always willing to furnish any kind of insulator you ask for -- but if you *don't ask*, you *don't know* what you are getting.

Is it worth the trouble to ask? The answer is right in your own office. You can find when insulators went into service, what kind they were, what replacements have been made, and why. Do this, and you will find why you should ask for O-B.

At no extra first cost, the element of service life measures the wisdom of your purchasing investment.

On all orders for new equipment involving switch and bus insulators, specify O-B by name. Your own records will justify this slight extra trouble.

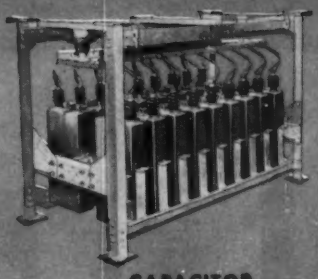
OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

4905-H

Ohio Brass

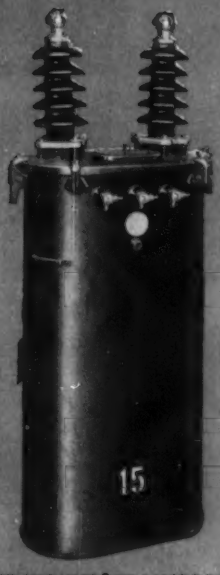
the Most Complete Line of Equipment for 20/34.5 kv Distribution

L-M'S 27 KV TYPE SS distribution valve type arrester provides low-cost protection for 150 kv BIL apparatus.

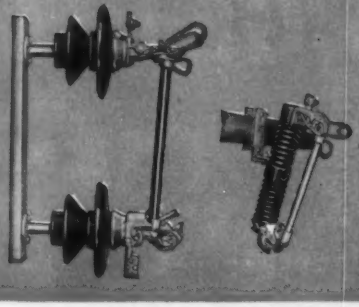


CAPACITOR EQUIPMENTS, blocks and banks to any size.

KYLE TYPE E RECLOSER, 23 kv, 150 kv BIL, in standard ratings, for single-phase extensions of the 20/34.5 system where the potential across the recloser will at no time exceed the maximum design voltage of 25.8 kv.



20 KV ROUND-WOUND® TRANSFORMER, specifically designed for this service, with 150 kv BIL, high overload capacity, low exciting current, and low losses.



TYPE HXO POWER FUSE (left) and Type HDO fuse cutout. The 27 kv, 100 ampere HDO has a rated interrupting capacity of 4000 amperes. The 38 kv, 200 ampere HXO has a rated interrupting capacity of 5000 amperes.

How 34.5 kv Distribution Cuts Costs... Here's Data on Methods, Materials

- Idaho Power Company pioneers 20/34.5 kv distribution, with ten years' experience.
- L-M pioneers, with research and development on apparatus, construction materials, and application for this economical distribution voltage.

by J. R. McDONALD, Field Engineer
Line Material Industries

Complete elimination of subtransmission, with fewer substations, higher feeder loading, and reduction of regulating equipment, resulting in lower cost per kva of installed capacity, appear to be among the major advantages afforded by 20/34.5 kv distribution, according to Idaho Power Company.

This progressive company now operates 275 pole line miles at this higher distribution voltage, and is expanding the system to serve additional farm customers. Idaho Power has found economical methods for conversion, and its experience is being generously offered to the industry. At the same time others, such as H. L. Hess of the Public Service Company of Indiana, Inc., have published the results of their studies.

LINE MATERIAL® Industries
McGRAW-EDISON COMPANY
Distribution Equipment

370-R

L-M Provides Information, Apparatus

L-M has collected some of this data, and is offering a compilation, along with information on the apparatus and equipment L-M engineers have developed in working with Idaho Power Company and others.

Mail This Coupon For More Information

Ask your L-M Field Engineer for copies of papers L-M makes available on 20/34.5 kv distribution, or mail the coupon—and we will send them promptly—no obligation.

LINE MATERIAL Industries, Milwaukee 1, Wisconsin EW-11248

Please send, free, copies of the following papers:

- ☐ 20/34.5 kv—An Economic Solution, by Don E. Haasch, Special Studies Engineer, Idaho Power Company
- ☐ 34.5 kv—A Possible Future Necessity, by H. L. Hess, Distribution Engineer, Public Service Company of Indiana, Inc.
- ☐ 20/34.5 kv Multi-grounded Wye Distribution System, by George W. Cooper, Line Material Industries
- ☐ Relative Merits of 20/34.5 kv Distribution by D. L. Andrews, Distribution Studies Engineer, Idaho Power Company
- ☐ The Long-Bus Substation, by D. L. Andrews, Distribution Studies Engineer, Idaho Power Company
- ☐ SEND ALL FIVE PAPERS PLEASE, IN FOLDER IMPRINTED WITH MY NAME

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Editorial Comment

NOVEMBER 24, 1958

Recognition for LBE and Man Behind It

"Live Better . . . Electrically" both as a slogan and as an industry-wide sales promotion program has gained wide acceptance with the public. It is a timely and a much-needed activity, as evidenced by the broad support it has received from all segments of the industry; so much support, in fact, that we sometimes overlook the courage and the effort that brought it into being.

The recent presentation of the James H. McGraw award to Ralph Cordiner, Board Chairman of General Electric Co, serves to remind us all of the contribution which Cordiner made in offering "Live Better . . . Electrically" to the industry. The award citation lauded Cordiner for "outstanding personal leadership and continued encouragement and support of the industry-wide sales promotion program which his company initiated."

Probably even more heartening to Cordiner and his associates, who have worked long and hard for "Live Better . . . Electrically," is the wide use made of this program. It must give them a warm feeling to know that the slogan and many facets of the program will gain new emphasis in the electric utilities' National Electric Living program which is to be launched in February.

Enemies of Research—Austerity, Skepticism, Impatience

The importance of research to the electrical industry has been repeatedly underlined in recent weeks by a number of eminent industry spokesmen. Coming as it does at budget time, this emphasis is particularly timely. It would be unfortunate indeed if a short-sighted view of economy, or doubts about the profitability of research, or impatience with the inherent delay between project and payoff, should bring ill-considered cutbacks in needed industry research.

To the austerity-minded, C. H. Bartlett of Westinghouse, speaking recently at the annual meeting of the National Electrical Manufacturers Association issued a forthright warning worth heeding today. He said; "Only two things can keep us from achieving the great goals which are attainable to us. . . ." "First, over-emphasis on present short-range economic problems which could cause us to re-trench on engineering development, and stop the great strides in scientific progress under way. The second danger is that the electrical industry will assume that these developments are coming, and not adequately sell and promote the use of power."

To the profit-minded, Sylvania's Don Mitchell, also speaking to NEMA, held out positive assurance that the electrical industry's $1.6 billion annual expenditure for research will pay a handsome profit. "Over the past 25 years", he said, "research expenditures have paid off at the rate of 100 to 200 percent per year. For every $100 spent on research and development, the return over a 25 year period has been from $2,500 to $5,000."

To the impetuous, those impatient with the pace of research achievement, both Bartlett and Mitchell counciled reasoned patience. Research takes time. Often 10 years or more elapse from project to product. This means that the results of most of our massive technical efforts since World War II have not yet been felt. But more immediately it means that cutbacks and delays in needed research today are a mortgage on the future prosperity of the industry.

It has come to this—either we keep up scientifically with the times, or we fall behind and pay the inevitable penalty. As an industry we can ill afford to let attitudes of austerity, skepticism, or impatience set the timing and amount of needed expenditures for research.

Impatience and Doubt Underscore

Con Edison' James Fairman tells Atomic Industrial Forum it's time for more work and less talking, advocates a PR fight on public apathy; AEC's John Floberg suggests emphasis on fewer reactor concepts could keep more firms in business

Efforts to reach agreement on a long-range program for atomic power development are being renewed against a background of industry impatience to get on with the job of building economic reactors—and gnawing doubts that there's room enough for all the manufacturers now in the business.

This is the major fact which emerges from the recent Atomic Industrial Forum meeting in Washington, and the stream of events at the AEC and the Joint Committee on Atomic Energy.

A stream of panel speakers at the forum meeting expressed satisfaction with individual projects in which they are involved.

'Not Satisfied . . . to Date'

But James F. Fairman, keynote speaker and senior vice president of Consolidated Edison Co of New York, Inc, voiced the overall opinion that "We are not satisfied with our progress to date."

The nuclear industry has outgrown the "fledgling" stage, said Fairman, and "It seems to me that we (industry and government) should agree on some kind of program . . to prevent repetition . . . and to channel our future efforts into the most useful and rewarding areas.

"In modern research and development," he added, "the old saying 'he travels fastest who travels alone' does not seem to apply. He who travels alone may still be pumping out his first vacuum tube when the team next door finishes the first year of work with its new fusion machine."

AEC Commissioner John Floberg suggested to the forum members that it may be time to start tapering off on exploration of basic new reactor concepts.

"The work of the near future may well be that of engineering improvement of the few basic concepts now well defined," he said, "rather than an over-expanding program based on new combinations of moderator, coolant, fuel, blankets, etc."

Floberg added the sober observation that, in the period before nuclear power comes of age, "there may well be periods when there may be difficulty in keeping everybody busy who would like to be busy. We in the commission . . . recognize how desirable it is that work be found so that skilled teams of nuclear experts can be held together. But the normal and healthy development processes affecting a new technology and a new industry are not equally rewarding to all. We would be more than glad to receive any suggestions on this theory that you may have."

FAIRMAN: 'This endless chain . . .'

The joint committee, meanwhile, has received more than 50 industry comments on its staff study outlining a proposed long-range program to have economic nuclear plants operating in the U. S. by 1970.

Committee sources say manufacturers generally approve of the program, with reservations, while investor-owned utilities back up the Edison Electric Institute's stand that the program should more clearly recognize the goal of maximum operation and ownership by private enterprise.

The committee expects to hear testimony on the proposed program during the annual "202" hearings next year. Meanwhile, the commission is not committing itself pending a study by its own Reactor Advisory Committee.

More Federal Reactors

There's a good chance, observers agree, that some Democrats will try to go beyond the staff study's recommendations and push for more federal reactor construction, in view of the overwhelming Democratic election victory. Certainly the election weakened the bargaining position of the AEC.

However, as one joint committee source puts it, "there's still no law that says the Administration has to build reactors, even if we vote them."

The 12-point legislative program outlined by Senate Majority Leader Lyndon Johnson (D-Tex.) includes the comment, "We need a program to develop the peaceful uses of the atom—with emphasis on an atomic merchant marine."

The reference to atomic ships has lifted some eyebrows among Democrats who would like to see funds and manpower siphoned away from the atomic power programs. However, as one says, "At least it might help keep some of the marginal companies in business."

The change of faces on the joint committee itself will probably have little impact, except to give veteran Democratic members like Chairman Clinton Anderson (N. M.) an even stronger grip. Four Republican members must be replaced—Sens John Bricker (Ohio) and William Knowland (Calif.), and Reps Thomas Jenkins (Ohio) and James T. Patterson (Conn.).

Replacements won't be named until January, but present speculation centers around Sens Frank Carlson (R-Kan.), Leverett Saltonstall (R-Mass.) and Kenneth Keating (R-N. Y.) for the two Senate vacancies, and Rep Keith Thomson

Session on Long-Range Atom Program

(R-Wyo.) for one of the two House vacancies.

Fairman, in his keynote talk to the Atomic Industrial Forum, complained about the atom's "political involvement."

"One obviously negative aspect of this political and international involvement has been the amount of expert time spent at meetings and hearings and conferences," said Fairman, "and in preparing for this endless chain . . .

"Each one serves some purpose," he conceded, "and for lack of contrary proof we must assume that each one serves its purpose reasonably well. But might we not be wise to give some thought to the amount of time we give to solving our problems in comparison to the time we spend talking about them?"

Urges Vigorous PR Program

Fairman also proposed a vigorous public relations program to overcome public ignorance and apathy about the atom.

"Public apathy to what we are trying to do is downright dangerous in this day of organized pressure groups and quickly shifting public opinion," said Fairman. "An individual who is not committed to a thought is a vulnerable target for the opposition."

Another speaker, Attorney Harold P. Green, proposed that the AEC's regulatory procedures for power reactor licensing should be revised to reduce red tape.

"One possible solution might be to retain the construction permit procedure, he said, "but limit it to approval of site, postponing consideration of actual safety questions until it is proposed to convert the permit into an operating license . . . The present charade of making a safety judgment based on general type of reactor and hypothetical, assumed and predicted numbers would be abandoned."

Several panel speakers brought forum members up to date on experience thus far on U. S. power reactors. These included:

• **Sodium Reactor Experiment**—The reactor itself, built for AEC by Atomics International at Santa Susana, Calif., has performed as expected. The only components which have not performed to specifications have been the steam generator and the intermediate heat exchanger, which transfers the reactor heat from the primary to the secondary sodium loop. No leaks have occurred, said William E. Parkins, chief of engineering for AI, but temperature distributions of these units have been improper.

Plans call for continued operation

FLOBERG: Time to taper off?

of the SRE to test performance of a variety of new reactor fuels suitable for high temperature operation.

• **Vallecitos Boiling Water Reactor**—The General Electric Co reactor, which went on line more than a year ago, has been operated at pressures of 900-1,000 psi at all power outputs up to 30,000 kw(t) with no signs of instability. The reactor responds quickly and easily to changes in turbine demand. Maintenance work on the reactor has proved relatively simple. During the last four months, the reactor has been opened 13 times to install, remove or rearrange fuel or equipment for experimental purposes. In one instance, less than 24 hours elapsed while the turbine was separated from the system.

Particular attention is presently focused on irradiation testing of fuel elements for the Dresden plant, said J. R. Walcott, manager of design engineering for GE's atomic power equipment department operation.

• **Organic Moderated Reactor Experiment**—Performance of this experiment, constructed and operated for AEC by Atomic International, has been "completely satisfactory" in its first year of operation. From January through October, the reactor operated 5,000 hours at temperature, neutron flux and heat flux that are typical of those presently proposed for full scale organic moderated reactor power plants.

The rate of decomposition of the moderator-coolant is somewhat lower than anticipated, and decreases strongly with increasing concentration of decomposition products in the coolant. Removal of decomposition products from the coolant has presented no problem.

"Operation of the OMRE," said A. B. Martin of AI, "has confirmed the many attractive features of this reactor type: High safety, operation at low pressure, use of standard materials and components, low activation of moderator-coolant and . . . ease of operation and maintenance."

• **Shippingport PWR**—"The most important single aspect of the Shippingport operation has been the lack of major problems," said L. R. Love, chief engineer of the station, in describing the first ten months of operation. It is evident that the reactor itself senses minor changes in steam demand initiated by turbine operation, and corrects automatically before the operator can take action on the basis of instrument readings. During tests, consisting of load dumps and load swings in both directions, it was found that the reactor plant has a capability for load swinging throughout the power range exceeding that of a conventional boiler plant.

Tests also have demonstrated the ability of the station to operate as a "peak load" station on the Duquesne Light Co system and indications are that it could also provide "base load".

More personnel are required than was originally expected. The roster, which first listed 130 people, now includes 190, and more are expected to be needed.

U.S. Power Picture

- **BPA considers sale of 'non-firm' energy to California**
- **King Coal to reign for 'long time to come,' says Sporn**

Bonneville Power Administration "non-firm interruptible" energy may be offered to California utilities if they will build transmission lines to take away the power.

"California is but one area where we might profitably sell energy which could be generated by water now being spilled during high flow periods," BPA Administrator William A. Pearl told Electrical World last week. Other areas he mentioned were British Columbia, Idaho, and Montana.

"The exact price of this energy, which would be marketed on 'dump' or 'steam replacement' basis, would have to be set," he said. He thought it might be low enough to justify heavy transmission expenditures by California purchasers but agreed there would be an element of risk, since the agency couldn't guarantee for how many years, or, indeed, for any year, whether power would be available.

Government spokesmen have been advising a series of BPA "customer meetings" during the past few weeks that if BPA rates have to be increased next year the amount would depend somewhat on how much non-firm interruptible power can be marketed.

"We are trying to feel the pulse of the market," Pearl said. No direct overtures have been made to any California utility, but Pearl indicated if favorable attitudes were detected he would approach the Interior Department for authorization to conclude mutually satisfactory contracts.

● Emphasis was on coal in late October and early November as power companies took time out for new steam plant dedications and for appraisal of coal handling.

At the Clinch River Plant of Appalachian Power Co, Philip Sporn put it this way:

"As of today, there still has not been found any other method of generating energy as economically as the advanced technical means utilized right here at Clinch River, utilizing economically mined coal as the basic fuel."

Sporn, head of Appalachian's parent company, American Electric Power Co, said plants under construction elsewhere on the system "bear evidence to our belief and conviction that this will be so for a long time to come.

The 450-Mw Clinch River Plant at Carbo, Va., will burn about 1.3-million tons of coal a year. In addition to the more than $60 million invested in the plant by the local power company, more than $35 million has been spent on the undertaking by Norfolk & Western Railway and Clinchfield Coal Co. An additional expenditure of $50 million is planned by the railroad and coal companies.

Close ties with allied industries is in evidence elsewhere on the American Electric Power system. The second 225-Mw unit at the Kammer Plant was placed in operation early this month. The Captina, W. Va., steam plant is tied in with Ohio Power Co's system, but the first two units are owned by Ormet Generating Corp, a subsidiary of a corporation jointly owned by Olin Mathieson and Revere Copper.

A third Kammer Plant unit will be owned by Ohio Power, which will operate the $93-million plant. When completed, the plant will burn about 2-million tons of coal a year transported on a ½-mi conveyor.

Long Island Lighting Co added another 185 Mw of capability with its third unit at Port Jefferson station. The $26-million plant addition raises plant capacity to 290 Mw, said LILCO Pres John J. Tuohy. A fourth unit, also 185 Mw, will go on the line in the fall of 1960. Coal is barged to the plant from railroad terminals near New York's harbor.

A new wrinkle in ocean transport of coal will eliminate the need for conventional discharging facilities at the Salem Harbor Station of New England Power Co. The cost-cutting step stems from successful launching of the first self-discharging super collier designed for ocean service. Automated equipment built into the ship positions a 250-ft unloading boom for discharge of 24,000 tons of coal at a rate of one ton per sec.

The specially built Salem Harbor facilities include an underground tunnel enclosing a belt conveyor that takes the coal to the power plant. Pocahontas Steamship Co, operators of the "S. S. Consolidation Coal," termed the maiden voyage and unloading operations "extremely successful."

TON OF COAL PER SECOND sprays off end of 250-ft push-button boom of new self-discharging collier to underground tunnel feeding New England plant

Rates and Regulation

• Accelerated depreciation pros and cons aired in Maine PUC hearing

Use of accelerated depreciation to reduce rates would only shift the burden to future customers or to stockholders, F. Merrill Beatty, Arthur Andersen & Co, said before a hearing of the Maine Public Utilities Commission on the $465,000 a year rate hike sought by Bangor Hydro-Electric Co.

He differed with Melwood W. Van Scoyoc, former assistant chief of the FPC's bureau of accounts, finance and rates, who testified for the commission in opposition to the rate increase, that this tax reduction method should be used in rate making.

6½% Hike Sought

The company seeks to boost its rates by 6½%, or $465,000 a year. Commission Attorney Peter Kyros said use of accelerated depreciation in computing the company's federal income tax would reduce the annual revenue need to $310,000.

In straight line depreciation methods, the same amount of depreciation is taken annually during the useful life of the specific property. With the accelerated method, a company claims depreciation at a high rate during the early years of the property's life—thus reducing its tax obligations for the period—and at a low rate in the later years, making taxes higher then.

Van Scoyoc said in an earlier hearing that while Bangor Hydro uses the straight line method the PUC should compute the company's expenses as though the accelerated method were being used. He reaffirmed this in the later hearing although company Counsel Albert Blanchard called it asking the PUC to "do something by indirection that it can't do directly"—that is, require the company to use the accelerated method.

He told the PUC he believes use of the optional accelerated method not only amounts to obtaining an interest-free loan from the government but is the "shifting of present-day cost to a future consumer. There is at least a cloud hanging over a company as to whether it can collect this cost in the future. To the extent that it cannot, this cost is shifted to the stockholders."

Beatty also said that he believes it is unsound for a utility company to use accelerated depreciation if it is not allowed to build up a reserve against future tax obligations.

Ohio Power Co Cited by Co-op

"The best ten-year record among the private power companies in producing and selling the lowest priced electric power to residential customers in the State of Ohio."

This is the inscription on an award presented to Ohio Power Co from one of its wholesale customers, Hancock-Wood Electric Cooperative, Inc. A. A. Armbrust, right, the company's Findley district manager, accepts the award from R. P. Luse, co-op manager.

Luse said the award is the first of its kind bestowed by the co-op.

Ohio Power's standing with its co-op customers ties into mutually beneficial working agreements, too. In its most recent wholesale power agreement, for instance:

- Co-ops give Ohio Power ample notice of expected load growth to permit the company time to provide needed facilities.
- If the company extends transmission lines through co-op territory, the company does not solicit customers "whose future full requirements . . . are not expected to exceed 500 kva within 24 months of commencement of service" and can be served from co-op distribution lines.
- Co-ops that were serving industrial loads before the agreement was signed at rates lower than Ohio Power's agreed to pay the company the lowest filed tariff for power resold to those industrial customers.

Under the agreement the company charges $1.125 per kva demand, and $.00480 per kwhr (equal to the product of 365 times the kva of monthly billing demand) with $.00420 for the remainder of energy used in the same month. Minimum monthly charge is equal to $2.50 times the kva of monthly billing demand but not less than $2.50 times 65% of the previous highest monthly billing demand during the preceding 24 months.

Management Sales and Engineering

Need for better rate levels, higher earnings, improved management techniques, more nuclear power, promotion of growth and attraction of technical manpower stressed at meeting of Association of Edison Illuminating Companies, October 22 to 25, 1958

The President's Address

WALTER C. BECKJORD, President of the Association of Edison Illuminating Companies and Chairman of the Board, Cincinnati Gas and Electric Co.

Important industry projects meriting serious consideration were presented in the opening address by Walter C. Beckjord, president of the Association and Chairman of the Board, Cincinnati Gas and Electric Co.

In the field of atomic energy, Beckjord called on the electric industry to continue to demonstrate its willingness and enthusiasm to further this development by even more projects to prove and improve the many attractive approaches toward commercial atomic electric power. This plea followed more specific ones by Messrs. Edwin Vennard, vice president and managing director, E.E.I., and R. E. Ginna, chairman of the board of Rochester Gas and Electric Corp, for industry support for the proposed gaseous diffusion reactor for which AEC is seeking bids.

In the field of public relations Beckjord emphasized the need for greater effort especially in the area of customer service and the maintenance of a front-line position in providing "leadership, workers, and financial contributions to all worthwhile civic, educational, cultural and humanitarian projects of the communities which it serves." He also pointed to chief executives and top management as the obvious pace setters for the rest of the organization in the matter of assistance to community projects.

Regarding rates, Beckjord stressed the need for utility managements to "seek rate increases to counteract the inflationary trend and increasing cost of capital," and to "convince regulatory bodies that higher rates of return on fair rate bases are essential to the continued health of the industry."

The engineering manpower shortage will continue to be a major problem in the years ahead according to Beckjord. He suggested that "student attitudes toward the industry would improve substantially if they knew more about the industry's engineering problems; more about the opportunities for promotion and advancement, and more about the importance of engineering under conditions of growth and expansion in the years ahead."

The problems of utilization of employed engineers came in for discussion. Beckjord pointed out that "poor utilization in many companies occurs by reason of dilution of the engineering content of an engineering job and not by assignment of engineers to non-engineering job classification. A recent study of 45 large electric companies indicated that the ratio of technicians to degree men ranged from a low of 11 per 100 to a high of 84 per 100. He recommended much greater use of non-professional and semi-professional employees.

In complimenting the industry on its accomplishments in controlling the cost of electric service, Beckjord pointed out that the record was possible, not because of an inherent characteristic of the industry but because of management achievement. He noted that the industry has a more than proportionate share of its top personnel in advanced management programs throughout the country, as compared with other industries.

Evolution in Utility Sales Management

E. J. INGRAM, Vice President-Sales, Jersey Central Power & Light Co and New Jersey Power & Light Co

"Today, there is a marked difference in the problems which utility sales management are reviewing and probing, and the solutions for which are being diligently sought," according to Ingram. It is no longer a question of selling any and all appliances and applications, or how many sales, but rather how many profitable sales are made he said.

Ingram thinks that the matter of selective selling should be carefully studied. He said, "Selective Selling does not mean the same thing to every person; even utility sales executives differ widely on what it means. That's the point—'Selective Selling' is, and should be different for every utility."

In the matter of pricing the electric product, Ingram said that "The most universal opinion of electric utility sales management is that electric utilities will not attract, let alone capture, a volume market in residential electric space heating with a demand and energy type of rate." He thinks that "in setting our sights on new markets the costs to serve and the resultant pricing must be figured on the basis of what such values should be in specific and attainable volume markets and not on heavily loaded guesstimates of what a few or isolated initial applications would be. That's the way the automobile people price their product and they are pretty good merchandisers."

Problems Discussed at AEIC Meeting

Report of Appliances and Servicing Committee

G. W. OUSLER, Vice President-Sales, Duquesne Light Co

"We are striving to promote the "All Electric Home" and the "Live Better Electrically" idea. We must not forget that in doing this we accept certain responsibilities; the responsibility to provide an uninterrupted supply of electricity; and the responsibility to see that the same kind of uninterrupted service for the appliance that uses this electricity is provided. This continuity of service applies just as much in the home as it does outside the home. For, no matter how dependable the service is between the generator and the meter, it does the customer no good if her appliances break down and she cannot get them repaired easily and at a reasonable cost."

"Ten manufacturers responded to a request for information on what their company was doing to make servicing of their products easier. The results were most heartening. Some 134 changes in design to permit easier servicing were reported" . . . "We have made changes in air conditioner design which permit repairs to be made in 20 percent less time".

Report of Committee on Load Research*

B. P. DAHLSTROM, Chairman and General Manager Rates and Market Research, Public Service Electric and Gas Co

When the winter load for groups of residential customers without electric ranges and with approximately the same annual kilowatthour use, in various parts of the country were compared, the committee found that "when the upper and lower limits of the data from all areas are plotted together in percent of peak values, it becomes very evident that there is not much variation in the curve shape. . . . For other annual kilowatthour use groups and for groups with electric ranges, many similar relationships exist."

*(Editors note: The significance of this report is emphasized by a more comprehensive treatment appearing on page 89 of this issue.)

Subcommittee on Water Heating Loads

"A shift from controlled to uncontrolled operation normally results in some increase in average use. Uncontrolled water heating, with either standard or high wattage elements, eliminates the problem associated with peak loads at the start of the charging period and improves the daily load factor of the water heating load. But it creates coincident demands on the average week day from 0.5 to over 1.0 kilowatt per heater during the critical morning (9:00-11:00 A.M.) and evening hours (6:00-8:00 P.M.) which introduces additional capacity responsibilities for the residential class of service on both distribution and bulk supply systems."

Subcommittee on Residential Lighting and Appliances

"Contrary to the thesis that electric clothes dryers and clothes washers would spread clothes washing over the entire week, it appears that the housewife continues to do more washing on Monday than on any other day."

Subcommittee on Electric House Heating

. . . "Annual load factor is approximately 20% for resistance heating and 16% for heat pumps. However, the load factor was found to be approximately 25% for all-electric homes with either heat pumps or resistance heating. This compares with present residential class load factors of between 35 and 40%" (for non-house heating customers).

"The Load Research Committee is continuing to collaborate with the Middle West Service Company in conducting a nationwide survey of the load characteristics of residential lighting. Twenty-two electric companies are now actively participating in this survey."

"The committee has been aware that with present availability of two new types of demand meters which enable load data to be processed directly into punched cards, there is now, and will be, a definite trend toward more companies entering into the field of load research."

Report of Committee on Power Generation

G. R. MILNE, Chief Mechanical Engineer, Consolidated Edison Co

"Steam turbine generator orders reach a peak at intervals of approximately five years, while during each interval the annual capacity ordered is only a fraction of the peak. The present cycle we are experiencing is no exception. The capacity ordered for 1958 aggregates only 8,374 megawatts compared to 17,414 megawatts ordered in the year 1955-56. This wide variation

(Continued on page 94)

Putting a Computer to Work

IBM 705's introduction for customer billing has impact on Detroit Edison's departmental procedures and on personnel

THOMAS E. HURNS, Vice President, Detroit Edison Co, Detroit, Mich.

Putting an electronic computer to work involves intra-company adjustments to the new and transitional procedures and to problems with personnel engaged in both. Detroit Edison Co encompassed such adjustments in the course of introducing the IBM 705 for processing customers' billing.

In introducing the new equipment, Detroit Edison envisioned these eventual benefits: Reduced departmental costs; maintenance or improvement of customer relations; and, a general streamlining preparatory to further inevitable developments.

Yet even the attainment of these objectives, the company found, left something wanting for the economic justification of its purchase and installation of the IBM 705. Extension of the IBM 705's application to a process in addition to customer billing, such as engineering studies, was an economic essential. And further employment, for instance in inventory processing, made economic justification easier again. From the beginning, Detroit Edison was aware that only a company of its own size could expect to develop any economic advantages from the use of a large electronic computer.

As Detroit Edison's customer accounting processes were already highly mechanized, the 705 was expected to displace some employees and some machines. Most of the personnel displaced would be absorbed by other jobs and through natural growth in the operation. The 705 has the capacity to handle such growth so far as its functions are concerned.

First bills processed by the 705 calculator went out after 600 meter readings had been fed into the machine and the bills came out to be sent to customers. This was just five months after delivery.

These Problems Arose

Transition from the old to the new method of billing was complicated by the fact that it had to be made without disturbing the flow of bills to customers or of payments into the accounts. It was also necessary to provide personnel with information to answer the daily inquiries of customers. Accordingly, three work forces had to be maintained, one to operate the old system, one to handle accounts in various stages of transition, and one the accounts on the new system.

The machine's tremendous speed and flexibility, the way it can read, write, figure and "remember" data justify some of the awe with which it has been viewed by the general public. But there were problems in its application, whose solution required many man-hours and talents.

There was a tremendous initial cost of preparing for the use of the 705 electronic data processing equipment and for its impact on the company. These machines must be "told" what to do in minute detail. Proposed routines had to be spelled out and new jobs designed. Much planning and decision-making were involved. Special rooms to house the equipment were designed and built. All this was time consuming and costly.

Relatively few electronic data-processing installations are fully installed and in complete operation even today. Much more experience has to be gained about their application before the true impact on operating expenses, company procedures, and jobs is known. This type of equipment has not yet been installed in any operation without costing more than had been anticipated. Nor has it performed all of the tasks expected of it. But users take these difficulties in their stride, because of the enormous, long-range benefits sure to accrue to the use of advanced equipment of this type.

There was the problem of the effect of the new machine on jobs. Actually the machine will not produce a wholesale lay-off of white-collar workers, certainly not at Detroit Edison. High-priced, highly educated specialists are not needed in wholesale numbers to run an electronic system, but many jobs are going to be made more interesting and challenging. Nevertheless, there remains the human relations problems. Some employees become available for other employment in the company; many more have changes in job responsibility. The problem of fitting the right employee to the right job and the resultant necessary training appear to be more of a problem than finding jobs for surplus employees. The emotional barriers to electronics must be overcome. The company must ward off resistance and resentment

CONSOLE at center is control point for the operations carried out in the various cabinets. Special air conditioned room had to be prepared for calculator at cost of $80,000 to the company

Involves Many Adjustments

to job changes and dispel people's apprehensions.

Customer accounting and billing at Detroit Edison includes: Meter reading; billing and its statistical by-products; the recording of payments; collection of delinquent bills; taking orders for service, opening and closing accounts; and, answering bill inquiries, as well as other activities.

Detroit Edison has 1,350,000 accounts in a service area covering 7,600 sq miles. This means that it must read more than 33,500 meters daily, calculate and prepare about 35,500 bills daily, and receive 39,000 payments to be applied to accounts.

Customer moves require the closing of 1,200 accounts every day and the opening of a larger number to take care of moves plus population growth. People and records must be available to answer promptly approximately 5,000 inquiries from customers each day. All of this lends itself to automation.

Activities Complicated

Basically, the work would be quite simple if all the company had to do was read meters, bill the accounts, and record payments. But, because many unusual situations arise, these activities are greatly complicated by the following:

18% of accounts are delinquent, needing special follow-up.

8% of customers make only a partial payment.

200 customers each day actually pay their bills twice or make other overpayments.

700 checks are received each day from customers who do not send along the coupon portion of their bill so that the company may know where to apply the payment readily.

The 705 computor is expected to facilitate the handling of these problems. It will get the bills out faster, tighten collection action, and mechanize the exceptions.

The 705 computer is considered one of the most advanced electronic data processing systems available for general office use. It would have had quite an impact on systems and procedures and on the employment of people had it not been for one thing: Detroit Edison's customer accounting activities were highly mechanized before the 705 computer was obtained. Therefore, while the machine further reduces the labor requirement per account, it actually replaces many other pieces of mechanized office equipment.

Concurrent with the installation of the 705 machine, many other changes were made in the organization and clerical procedures. The transition in customer accounting operations is only partially due to the introduction of large-scale electronic equipment, although the 705 did open up a new approach. A modern system is being designed for use with the computer.

In planning the use of the 705 computer, present organization, policy, and routines were not considered as necessarily permanent. Operations were shifted from one department to another. Departmental organizations were realigned. Routines and procedures were changed within departments. Some changes could have been made to advantage, no doubt, without the computer, yet the computer sparked them.

A staff of programmers was established to finalize the design of the system and write out the programs for the machine to follow in performing its tasks. Actually, about 45 man-years went into designing the system, writing the programs, and testing the programs before the machine was put into operation. Over 40,000 program steps or instructions are needed to tell the machine how to perform its customer accounting task. It takes seven passes through the machine each day.

In addition to designing the normal procedures for the machine to perform, it was necessary for this special group of programmers to detail the operations for converting from the old to the new system. The machine was used for much of the conversion work. This required 12 more daily passes through the machine and some 20,000 more instructions.

Personnel Screened

Selection and training of the original programming staff was as difficult as was the design of the system for the machine. The 705 machine had never before been asked to perform a public utility customer accounting job. In fact, at that time very few large-scale computers of any kind had been installed for a major office operation. The company didn't know exactly what the programming job required and was not aware of the qualifications for a good programmer.

The selection of programmers requires special testing and screening. Most of them have college training which is considered desirable. But some excellent ones have not been to

CONFERENCES worked out many problems of detail in the conversion process

college, yet have qualities that make them suited to this work. In general, accounting training is helpful and mathematics training is an advantage.

Before the 705 calculator could be installed, it was necessary to build a special room with 3,200 sq ft of space to house it. The machine and equipment surrounding it require a room especially air conditioned to dissipate their heat, which is sufficient to heat five five-room houses. The air must be purified and kept within rather rigid humidity limits, so that the machine can read accurately the information on its magnetic tapes. The calculator required 75 kw of 3-phase, 60-cps power, besides 25 kw for air conditioning.

Processing Frozen

When the 705 calculator was delivered, the work was just begun. From the November 1956 delivery date through the middle of March 1957 it was used exclusively to test the accuracy of the programs and prove out the basic design of the system. Concurrently, elaborate training programs were established, not only to train the people for operating the machine but also for all the clerical force, including 60 extra employees who had to be added to perform the special operations necessary to converting from the old to the new system. It was estimated that ten months of continuous work would be necessary. Actually, it took about 12 months of conversion effort.

The conversion period required much careful planning and scheduling. The lead time before an account was actually converted was about four weeks. During this time it was necessary to freeze the processing of orders and posting of payments, while keeping an accurate record for performing service to customers. The conversion schedule was geared so that the billing department could work into the transition gradually. During the first month it converted only 600 accounts per day. The second month, this was increased to approximately 2,500 daily; by the third month to 7,500; and the fourth month to 8,500 per day. This was the maximum load that could be handled.

Detroit Edison estimated that it will take about one year after conversion before the new customer accounting operations—mostly the changes external to the machine itself—are "shaken down" and running smoothly. The efficiency the new system will bring cannot be determined accurately, yet substantial savings are sure to result. Transition costs are expected to be recaptured within three years.

During the peak of conversion, the 705 machine operated nearly three shifts a day; when conversion was completed, it was estimated that it took about 10 hr of computer time each day to handle customer accounting operations. After such operations machine time is available for other activities.

It is desirable to keep a machine of this size in continuous operation. Therefore, studies are being made with a view to putting all employee data handling activities, including payroll, on the 705 computer early in 1959. A group is studying material and supply records and inventory control with a view to putting them on the new machine, and plans are being laid for solving many engineering problems on the 705 and a smaller IBM 650 calculator.

What 705 Accomplishes

Based on our experiences, a number of observations can be made:

1. Installation of the IBM 705 equipment is an evolutionary change rather than a revolutionary one. This will be the case in the majority of electronic machine installations, and this approach minimizes the computer's impact on the job.

2. Value of the equipment is in proportion to the skills of the people designing the system, programming for the machine, and operating it and carrying out related clerical operations. This calls for much advanced planning, recruiting, and training of key personnel.

3. Even machines of this magnitude are merely new advanced tools to perform work faster and more accurately.

4. The machines have many limitations. They can't perform many operations within reasonable economic limits. Much more developmental work needs to be done by manufacturers in cooperation with users.

5. An electronic system does not tolerate imperfections. This means that sufficient controls must be set up to assure absolute accuracy of input into the machine. In designing a program, allowances must be made for handling unforeseen conditions.

6. Until more experience is gained from actual operations, many new assignments to the machine will be on a trial-and-error basis.

7. The cost of planning and programming an electronic system, as well as the added cost of converting to a new system, is much greater than anything heretofore experienced in an office. They require careful study before such equipment is ordered.

8. Electronic machines now in the planning stage will make present machines obsolete in a few years, thus opening up entirely new avenues in data handling.

STORED-PROGRAM DIGITAL COMPUTER was dropped into the accounting operation "assembly line" in place of an electronic calculator and other units. The computer replaced numerous card sortings with simplified working procedure

Medium Computer Proves Its Value

- **Helps absorb three wage increases to cut billing costs**
- **Cash-posting operation saves $20,000 annually**
- **Provides for engineering and other calculations**

JOHN G. CADBY, Assistant to Vice President and Controller, Wisconsin Electric Power Co, Milwaukee, Wisc.

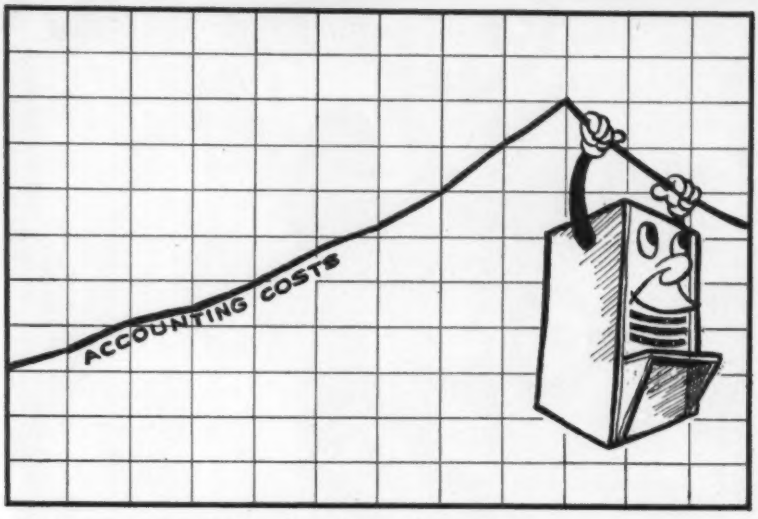
Application of a stored-program digital computer has helped hold the line on, and even reduce somewhat, the costs of customer billing at Wisconsin Electric Power Co. Use of the computer in add-on preparation and notice itemization work is saving $20,000 annually. The computer also has proved itself in making engineering calculations and numerical analyses.

Principal advantage of the IBM 650 magnetic drum data processing system in electric billing is work simplification and reduction in card handling. Compared with the former operation using a 604 calculator, the computer has eliminated 13.6 million card sorts per year for bill computation and 25 million card sorts for revenue summary work. Mechanical methods have been substituted advantageously for manual methods in the computation of prorate periods and in the averaging of accounts with the 650 computer.

These advantages are based on over three years' experience with the 650. Wisconsin Electric Power was one of the first two utilities to install this computer system; installation date was August, 1955. The first job placed on the 650 was electric service billing, with the computer used with numeric tabulating equipment and a 9300 punching addressograph machine.

An advance card file is maintained by the company. Arrears and merchandising items are added mechanically to current bills on punched cards, which subsequently are cut to postcard size for mailing. The 650 performs these major functions: Calculates consumptions and bill amounts from current meter readings in punched marked-sense billing cards and punches these results back into the same cards. It also compiles route control and revenue and sales analysis statistics in memory during the calculation run and punches these data into output cards twice a day.

Results of the bill calculation are punched into the card that contains meter readings and other data by using a 537 read-punch unit. In addition, under the new procedure the total net and total gross amounts are punched into the cash stub of the bill by means of a 528 accumulating reproducer. After the 650 operation, billing cards are used to print bill forms, prepare bill registers, reproduce advance cards, and serve as the accounts receivable record. Wisconsin Electric serves



COSTS ARE LOWERED through use of medium-sized computer, despite wage increases and growth in the number of customer accounts to be processed

532,000 electric customers, 76,000 gas customers, and 1,300 steam-heating customers in 385 communities. Billing for 420,000 electric customers with 515,000 meters is handled centrally from the Milwaukee general office. The effect of the 650 computer on accounting costs for a system of this size can best be shown by comparing costs in 1957 with those of 1954, the last full year in which the 604 machine was operated. In 1954 the cost per account billed was $3.57. After applying three successive wage increases to labor costs for 1954, the theoretical cost would be about $4.00 per account. However, actual cost as of September 30, 1957 was $3.50 per account billed. Thus, three wage increases have been absorbed and yet costs are 1.75% below those for 1954. This improvement was due to the 650 machine and modifications of procedures, including the centralization of all accounts receivable bookkeeping.

The stored-program computer did not require a complete rebuilding of the billing system; it was substituted for the 604 and certain other machines in the assembly line of the existing basic system. The method of addressing bills and billing cards, the method of getting meter readings into the billing cards, the system of having advance cards and a number of other conditions were not changed.

Planning for the 650, development of proper instructions and optimum programming of instructions added up to a major undertaking. About 4,000-man-hr of development staff time was required. The 650 was operated for the first few weeks by the development staff. The girl who previously ran the 604 calculator was trained by the development staff to operate the 650. She now handles practically all situations, referring unusual and involved problems to her supervisor. The supervisor of the electric service billing group attended the basic and the advanced 650 classes and received further training from the development staff.

Production Up 15%

The development staff followed operations closely for the first few months. After new sub-routines were added to the 650 operation, the entire operation was re-programmed for optimum time, thereby increasing production by about 15%. For the past year, output has been 75 cards per minute.

Operation of the basic computer system can be improved by addition of "new" peripheral equipment. For example, the 537 read-punch unit eliminates six operations involving other machines and simplifies the 650 operation. The unit also saved $300 a month in the cost of bill forms because extra bills for additional meters will no longer be required as 650 output cards.

The 537 read-punch has a maximum punching speed of 155 cards per minute, which so exceeded the existing computing speed of 75 cards per minute that the 653 high-speed storage unit was justified. The entire electric service billing procedure was re-programmed for use of the 537 read-punch unit and the 653 high-speed storage unit. With this combination an output of 152 cards per minute was attained.

The second major operation transferred to the 650 was add-on preparation and notice itemization work. This operation begins with mechanical cash posting, which is performed on a collator monthly. The accounts receivable cards for full payments are withdrawn and cash cards for partial payments are filed into the deck of unpaid accounts receivable cards. Three days after mechanical cash posting, the remaining cards are placed into the 650.

Cards in file at this time are: Unpaid current charges, unpaid merchandise cards for charges, and unpaid arrears charges, all on last month's bill; and partial payments or cash received after mechanical cash posting. Cards are read into the 650 which combines like charges, posts cash to corresponding charges, ages accounts, determines whether accounts are subject to collection action, and accumulates forfeited and allowed discounts by route.

The computer punches out the following cards as appropriate: New balance-forward for electric service; separate balance-forward for merchandise; investigation for irregular conditions, such as a credit balance on merchandise; notice itemization for accounts to be collected; and collection for merchandise arrears charges to be referred to a collection correspondent. Balance-forward cards are listed for cycle balancing and then are used as add-on cards for printing the arrears amounts on the bill and the bill register.

Although the above job is comparatively small in terms of time and volume, programming the 650 for the operation was very complex. Machine instructions for this operation require 1,600 program steps, about twice as many as for electric service billing. The operation re-

placed these manual tasks: Calculation of balances forward and key punching of these balances; selection of accounts subject to collection action; and typing and mailing of separate cut-off notices. Handling of the operation on the 650 brings increased accuracy; thus the amount of balancing work is reduced.

This use of the 650 eliminated six clerks for a net annual saving of $20,000. Total cost of developing and programming this procedure was only $13,000.

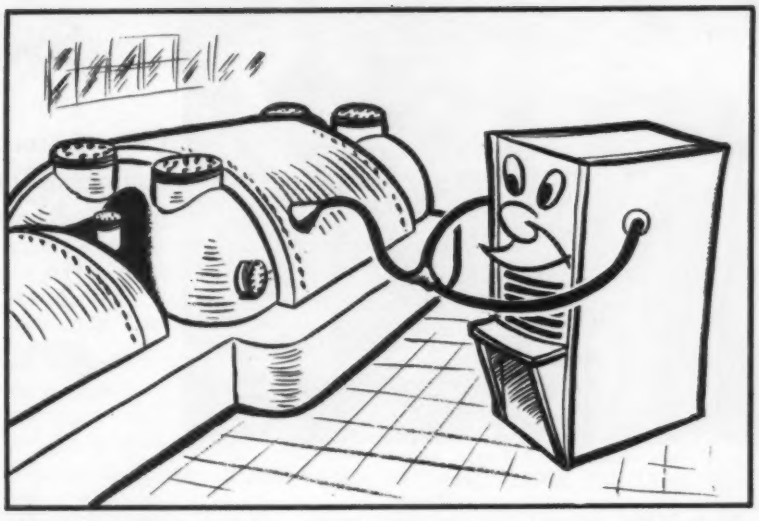
As time is available and the need arises, non-accounting jobs are being done on the 650 computer. The engineering problems among these jobs usually can be done in less time and with greater accuracy than by the former manual methods. For example, it was necessary to build a new road to a steam plant under construction. The road began 93 ft above the floor level of the plant. A cut-and-fill formula from the IBM library of 650 programs was modified for local conditions. The 650 processed the problem in 17 min; manual calculation would have required 110 hrs.

Forecasts Trends

Another program developed by Wisconsin Electric Power computes statistical data trends and forecasts data for any number of years based on the calculated trend. With this program the peak demand has been calculated for the entire system and for various sections of the system through 1977. The time for each of 35 such computations by the 650 is about 2 min; each calculation by hand would take about 8 hr.

A program to calculate transient stability limits of a distribution system under fault or abnormal conditions is available for our use. Whereas calculation on an analog computer requires 4 hr, the first calculation on the 650 required 1 hr. Subsequent calculations required only 15 min each. The calculation of 87 transient stability problems required 41½ hr of 650 time. It is estimated that 295 hr would have been required for the same results on the analog computer.

Another engineering problem under development determines the effect of the loss of field excitation of a synchronous generator. As far as we know, this is the first time calculations of this type have been made on a digital computer. Up to 1958, over 21 loss-of-excitation problems have been calculated, requiring 8 hr of 650 time. The same calculations on a manual basis would have required 2,250 hr. Thus, the computer is providing information which never has been available before.



GENERATOR PROTECTION for loss-of-field condition is based on digital computations, as are other engineering solutions speeded by the computer

The 650 also has been used for a number of smaller jobs: Analysis of semi-annual customer opinion surveys; a special unit-of-consumption analysis; preparation of rate conversion tables for a general wage increase; calculation of a set of power factor tables; and unit pole costs for an analysis in plant accounting.

Plans to expand the use of the 650 will continue. Several pay roll systems which will be compatible with the 650 are being studied. Being completed is a problem in the customers' accounting area to compute large industrial primary accounts which are billed manually. It is hoped the 650 output cards ultimately can be used to mechanically prepare an 8½x11-in. paper bill containing the detailed breakdown required by these large users.

Modernize Accounting to Control Costs

Wisconsin Electric Power believes in modernizing its accounting operation whenever a "better" way is found. Thus, the company was the first to use punch-card equipment in 1919 to compile statistical data. Such uses grew until punched cards were used in 1940 in an electric service billing procedure using master extension cards. Further savings were effected in 1952 with the use of an electronic calculator. In 1955 the company adopted the magnetic-drum digital computer, later adding a new read-punch unit and an accumulating reproducer.

The effect of this philosophy of adopting a "better" way, even when the savings might be small, is shown by comparing accounting costs over a 44-yr period:

Item	1914	1958	Times Increased
No. of Accounts	35,871	565,000	15.7
No. of Employees	78	297	3.8
Accounting Payroll	$41,700	$1,486,000	35.6
Avg. Salary/Employee	$535	$5,000	9.4
Accounts/Employee	460	1,900	4.1
Labor cost/Meter billed	$1.16	$2.63	2.3

Switch Customer

Ohio Edison changes over from manual equipment to handle 661,000 residential and small commercial customers' accounts

ELECTRONIC BILLING SYSTEM is explained to customer-accounting employees just prior to billing in the division. Customer-contact personnel should be briefed also so that customer inquiries can be handled effectively for everyone

G. J. GLUCK, General Supervisor Customers Accounting, Credits, and Collections, Ohio Edison Co, Akron, Ohio

All residential and small commercial customers—about 661,000 accounts—of Ohio Edison Co now are addressed and billed from a central location using electronic punched-card accounting equipment. In making the changeover from manually-operated key driven accounting equipment, the company set and met these goals and achieved these benefits:

1. Preparation and changeover of billing was done in 26 months.
2. Number of personnel in the new billing center is within initial estimates.
3. Equipment required exceeds original estimates by only one machine and 1.5% of rental costs.
4. During the final month of changeover, billings covered 649,000 installed meters, although original planning was based on only 630,000 installed meters.
5. Total number of employees in accounting operation was reduced as anticipated, but no employee was laid off.
6. Accounting costs have not risen. Further cost reduction is expected as personnel become more familiar with the new system.

The significance of realizing these goals and benefits can be judged by a more detailed look at Ohio Edison's new accounting operation. The installation includes the use of mark-sense meter reading, IBM 607 electronic calculators, 402 and 403 accounting machines, and the usual peripheral array of sorters, collators, reproducing punches, summary punches, interpreters, key punches and verifiers. This installation bills the residential and small commercial accounts among 563,250 customers (661,225 installed meters) in central and northeastern Ohio in an area of about 7,500 sq miles.

Accounting Centralized

Cycle billing of all residential and small commercial customers' accounts is centralized at one location with accounts receivable records located in 10 of the 31 divisions and district offices. Billings for other than residential and small commercial customers accounts are prepared manually in division or district offices. All residential rate schedules provide for energy charges on a block rate and contain provisions, when applicable, for load factor and multi-family billing. Small commercial rate schedules contain provisions for load factor and primary metering discounts. All rates are billed for net and gross amounts. As applicable, minimum charges may be determined by line extension plans. All billing loads reflect a 60% ratchet on an annual basis.

Prior to May, 1950, all customers' bills were addressed in a central addressograph section; billing was performed at three division offices. Bills for residential and small commercial customers were prepared on manually-operated, key-driven equipment. A stub plan accounts receivable record was maintained.

With a merger in May, 1950 of a company into Ohio Edison, the centralized addressing and billing operation of this company was acquired. The newly-acquired accounts were billed with manually-operated, key-driven equipment. Billing practice for these accounts encompassed a prebilling operation and the entering of each amount to be billed on a meter reading sheet. A register sheet plan accounts receivable record was maintained.

Early in 1955 a feasibility study of customer billing on a punched-card system was prompted by (1) The need for uniform customer billing and accounting practices throughout the company, (2) The obsolescense of most of the equipment at each addressing and billing location, and (3) The fact that equipment acquired in the 1950 merger did not provide satisfactory statistical data.

The decision to install a punched-card system to handle the addressing and billing of all residential and small commercial customer accounts at a central location was based on (1) A possible savings in operating expense, (2) The mark-sense method of punching meter readings into billing cards, (3) a mechanical means of calculating and proving accounts billed on load factor rate schedules, (4) proven machine and system operation in many electric utility companies, and (5) the availability of electronic calculators which would provide sufficient capacity and program steps to handle the volume of work.

To centralize and mechanize the billing operation at one location, a uniform customer account number ing system had to be established.

Billing to Electronic Punched Cards

This system would eliminate the many duplications and lack of uniformity in the then existing systems. Meter reading routes, meter reading dates and final dates for payment of net amount had to be adjusted to provide a balanced daily work load. These changes were made concurrently with the changeover to punched card billing.

Preparation of forms and procedures, wiring of control panel boards for the billing system, and preparatory work for the new numbering system were accomplished in 11 months beginning November 1, 1955. This work was performed by five employees assisted by manufacturer's representatives. This group included the general supervisor of customer accounting, the newly appointed central billing section supervisor, the assistant supervisor, and two members of the methods section, none of whom had previous punched card experience.

Most of the first several months was spent in attending manufacturer's schools and training courses and visiting other utilities with similar installation. During these visits valuable information was obtained on the application of punched card equipment for billing electric service accounts. The next several months were devoted to detailed planning of the system, assignment of town codes, revenue class codes, rate codes, card numbers, other coding and identification requirements and writing procedures.

The punching and verifying of the original cards was performed by ten temporary employees who were employed about three months prior to commencement of the new billing. Those applicants obtaining the highest grade in card punch operator aptitude tests were employed. The eight inexperienced girls among these ten were trained by manufacturer's personnel at his training center or on Edison's installed machines.

With the cut-over to the new system to extend over 15 months, it was anticipated that the ten temporary employees, using key punch and verifier machines rented temporarily, would be able to prepare original cards in advance of need. With the exception of the temporary personnel and one non-company machine operator, all personnel in the billing center, including supervisors, were company employees transferred from other customer accounting department operations. All employees whose jobs were eliminated because of the change and other employees who desired to transfer to the billing operation were placed before any new people were employed.

All supervisors received training in the new system. In addition, regular training courses were attended by a senior key punch operator and two senior machine operators, all of whom transferred to the billing center. After the training period, these three employees worked closely with the planning group prior to installation of the first machines. Other employees transferred to central billing as needed and as the work load on the old system was reduced. These employees received only on-the-job training from supervisors and senior operators.

Manufacturer's representatives wired many of the original sets of control panel boards. However, by assisting with this work the billing supervisors and senior machine operators obtained valuable training and wiring experience. As a result, all control panel board wiring changes required subsequent to the original wiring were performed by our own personnel. During August and the first part of September, 1956, the final checking of control panel boards and test runs under actual billing conditions were made.

First customers' bills were prepared and mailed on September 26, 1956; the cut-over of all accounts was completed with the mailing of customers' bills on December 26, 1957. The number of installed meters changed-over each month to the new billing system ranged from 21,840 to 60,691.

Immediately prior to the changeover of the first accounts in a division, meter readers were acquainted with the new system and instructed in mark-sense meter reading. Meetings also were held with customer accounting and other division personnel to explain the new system, and to acquaint them with the new forms and procedures. Copies of written procedures, as applicable to particular customer accounting functions, were provided for study.

Although 11 months were allotted for preparation and 15 months for change-over of accounts, it was felt many times that insufficient time had been allowed. The 11 months for planning, preparation of forms and writing procedures was sufficient only because a definite completion date was set for each phase or step of the preparatory work. A great amount of extra effort and hours were needed to meet each deadline.

Problems Overcome

Two of the most serious problems during the changeover were (1) maintaining the schedule for punching and verifying original cards from the meter reading sheets, and (2) the detail work with respect to processing change orders. A contributing factor was the concurrent changing of all customers' account numbers and the rerouting of all meter reading routes. However, this was the most economical method of handling the change because it eliminated the need for changing customer's account numbers on the addressograph plates and the manual pro-rating of customers' bills for adjusted meter reading periods. These additional jobs would have been necessary if the change of account numbers and rerouting had been made prior to installation of the new system.

In retrospect, the change could have been made more efficiently if (a) more original cards had been prepared prior to commencement of billing on the new system, (b) an average not exceeding 40,000 installed meters had been changed-over monthly, and (c) no additional pickup of accounts had been made on the second month. These changes would have provided a more even work load. They would have allowed a better review of some of

(Continued on page 105)

Comparison of 2-Year Interruption Records

Circuits Protected by Breakers		Circuits Protected by Reclosers	
Circuit Miles of Covered Wire — 545.77		Circuit Miles of Covered Wire — 242.24	
Circuit Miles of Bare Wire — 477.68		Circuit Miles of Bare Wire — 1,158.11	
Cases Covered Wires Down (Transients)	69	Cases Covered Wires Down (Transients)	14
Cases Bare Wires Down (Transients)	9	Cases Bare Wires Down (Transients)	12
Cases Sectionalizing Fuses Blown	12	Cases Sectionalizing Fuses Blown	28
Number of Breaker Operations	69	Number of Breaker Operations	343
Number of Faults Cleared	23	Number of Faults Cleared	114

Can Reclosers Replace Breakers?

Though heavier circuit loadings limit application, fast reclosers run up a service record for fewer wires burned down

E. L. LEINBACH, Distribution and Line Standards Engineer, Planning and Project Engineering Department, Detroit Edison Co, Detroit, Mich.

Growing circuit loadings and increased use of aluminum conductor put new emphasis on distribution circuit protection, particularly on the speed of breakers on primary circuits.

Substitution of line-type, pole-mounted reclosers (instantaneous trip) for circuit breakers (delayed trip) at substations in suburban and rural areas of the Detroit Edison Co system has proved satisfactory and economical. These substations usually feed a small town and as many square miles of surrounding countryside as practicable. Light loads permit the use of small substation transformers, thereby keeping the short-circuit current within the rating of a recloser.

Selected for Similarity

Within village limits the circuit is of covered wire; beyond the limits the wire is bare. The quantities of covered wire used make the fast opening reclosers an ideal "breaker" for likely transient faults.

In the table interruption records for 1956 and 1957 of 30 circuits equipped with reclosers (1½-to-2-cycle opening) are compared with those of 30 circuits with breakers (10-to-14-cycle opening).

So far as possible, circuits similar in duty and mileage were selected. Although it may not be practical to draw hard and fast conclusions from such limited records, a trend is indicated, and results parallel those of a study of a year's operation.

From Table 1, it can be seen that:

1. The number of instances of wires burned down per 100 circuit miles because of transient faults on circuits equipped with reclosers is about 50% of those on circuits with breakers. This ratio holds for bare and covered wire.

2. About 10% of the sectionalizing fuses were blown every year with each type of protection.

3. Circuits with reclosers cleared five times as many faults with no trouble found as did circuits with breakers.

4. Circuits with reclosers had five times as many momentary interruptions as did those with breakers.

Two elements have influenced these records to some extent. The recloser has a much larger switching orbit than the breaker, and it is reasonable to assume that the delay in opening the breaker burns down wires which could be saved by fast-opening reclosers.

There are several factors which limit recloser application. The prospective rate of load growth and the initial load on a circuit determine the size of the station transformer and therefore the short-circuit and steady-state duty imposed. The trend towards increasing circuit loads appears to indicate that use of fast-opening reclosers will decrease.

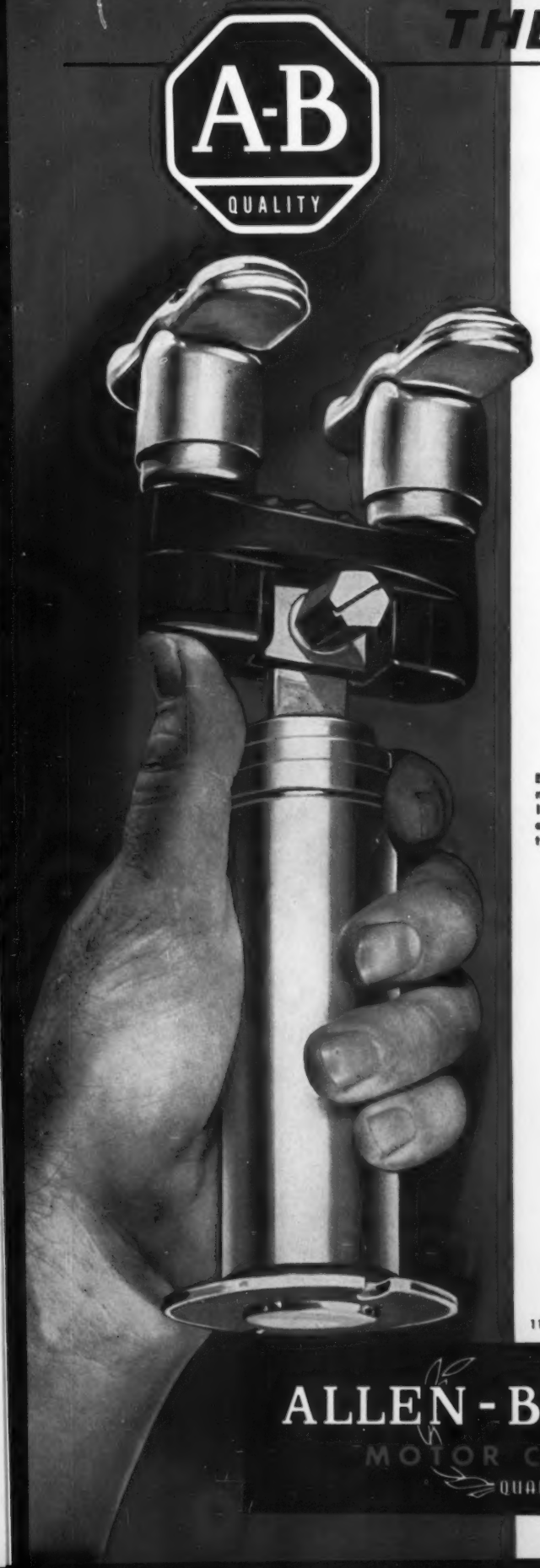
Along with growing loads, there is a trend towards higher distribution voltages. Many engineers are considering distribution systems up to 34.5 kv wye. As overhead wires will probably be bare at such voltages, the benefit of the recloser in improving service may become less pronounced, in spite of the two-year record in Table 1.

Another factor becoming important is the mileage of aluminum wire used. The advantage of the recloser with covered aluminum wire is greatly reduced. On many standard conductors, the arc destroys the wire faster than the fastest recloser can extinguish it. Another factor is the frequency of scheduled maintenance and inspection which is greater for the recloser than for any other item of station or line equipment.

Annual Charges Important

The original investment in reclosers for a station is about a third that for breakers. Whether it is truly economical to install reclosers depends, however, not on first cost but on whether load growth and high short-circuit current values will compel removal in too short a time for the installation to reach the break-even point in annual charges.

Whether to install remains the problem of the planning engineer. He must be acutely aware of the dollars that can be saved in annual charges through the installation of low-cost equipment when it defers the investment in high cost equipment long enough.



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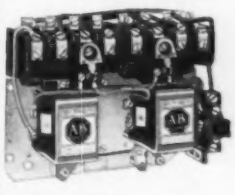
CONTACTORS

Bulletin 202 solenoid type contactor. In ratings to 150 amp. Also, clapper type to 600 amperes.

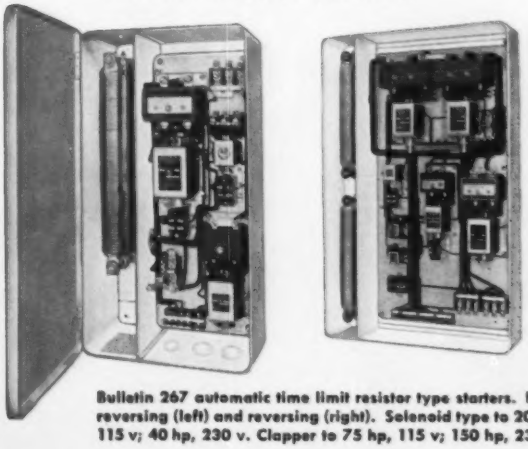
FULL VOLTAGE STARTERS



Bulletin 205 full voltage reversing starter. Ratings to 1½ hp, 115 v; 2 hp, 230 v.

Bulletin 209 full voltage starter. Available in ratings up to 1½ hp, 115 v; 2 hp, 230 v.

REDUCED VOLTAGE STARTERS



Bulletin 267 automatic time limit resistor type starters. Non-reversing (left) and reversing (right). Solenoid type to 20 hp, 115 v; 40 hp, 230 v. Clapper to 75 hp, 115 v; 150 hp, 230 v.

11-58-MR

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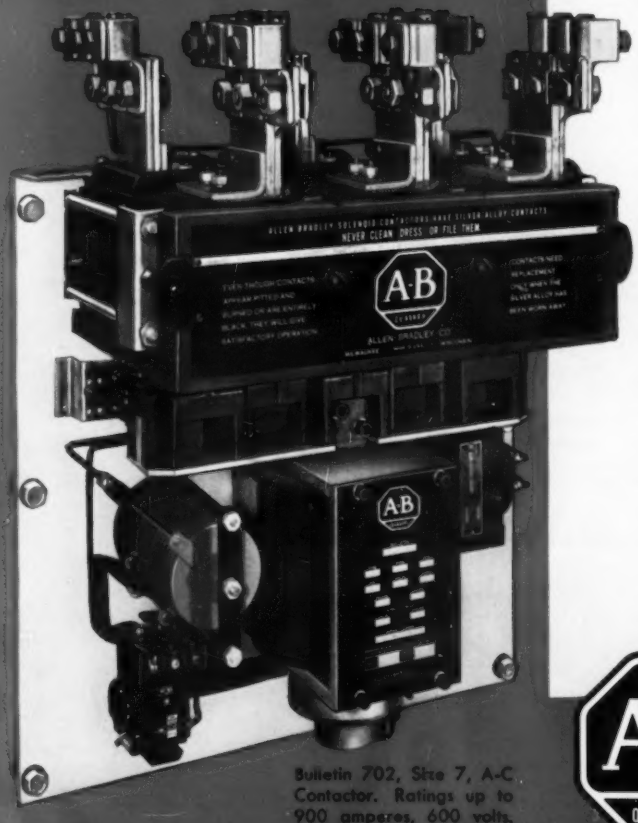
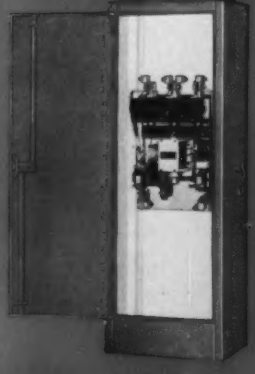
The simple solenoid design—exclusive with Allen-Bradley in the big starter sizes—has only one moving part. This eliminates the trouble causing bearings and flexible jumpers of conventional clapper switches . . . and assures millions of trouble free operations. A-B solenoid starters also have double break, silver alloy contacts that never need any servicing. They are always in perfect operating condition—until the contact is completely used up.

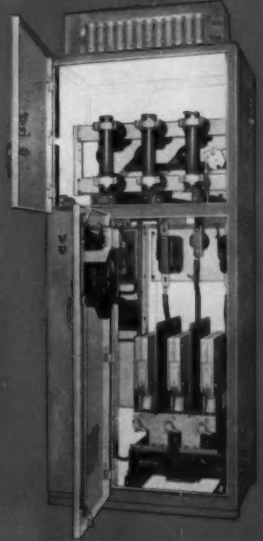
This time-tested solenoid construction is available on *all* Allen-Bradley starters up through Size 7 . . . as well as on A-B's rugged, air break, high voltage starters. Write for full information.



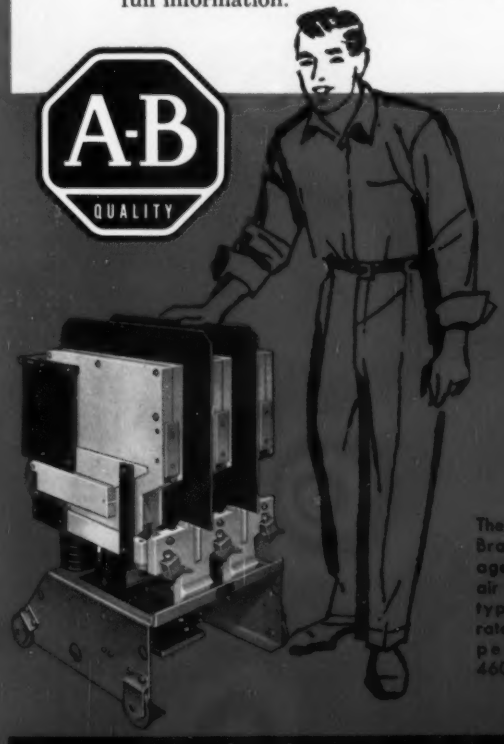
Bulletin 702, Size 7, A-C Contactor. Ratings up to 900 amperes, 600 volts. This basic solenoid contactor is used in large A-B low voltage starters.



Bulletin 709 across-the-line solenoid starters are made in ratings to 300 hp, 220 v; 600 hp, 440-550 v.



A-B high voltage starters are built for all types of motors. Ratings to 1500 hp, 2300 v; 2500 hp, 4600 v.



The heart of Allen-Bradley high voltage starters is this air break, solenoid type contactor—rated at 400 amperes, 2300 or 4600 volts.

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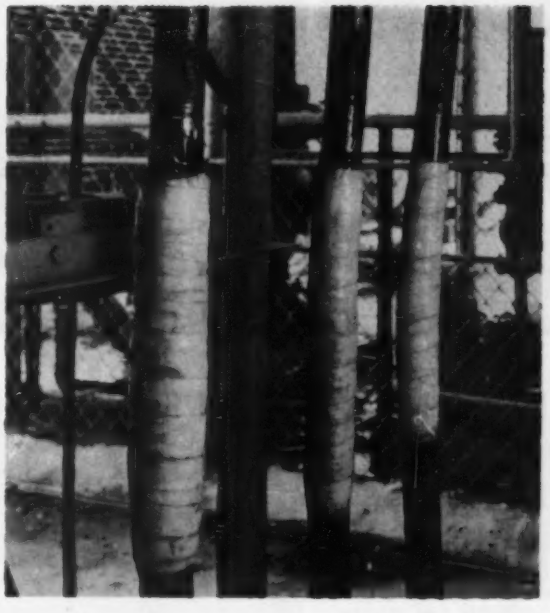
11-58-MR

Plastic Inserts Help Find Faults

JOHN J. RUECKERT, Senior Engineer, Baltimore Gas & Electric Co, Baltimore, Maryland



Wrapped plastic inserts are used to interrupt cable-sheath current paths on a fault intelligence system at a Baltimore shopping center. Considerable savings resulted through the use of the company-developed inserts compared with the usual procelain insulating joints.

A layer of neoprene tape forms an oil seal which prevents seepage of cable oil into the plastic during curing. Four half-wrapped and one butt-wrapped layer of epoxy-impregnated orlon tape follow. The reinforcing tapes permitted changes in the resin compound to give a harder material and an improved bond with the lead sheath.

Previously an attempt was made to use a cast resin insert with no reinforcing. However, pressure on the oil in the cable caused oil-filled bubbles to form in the plastic before it hardened, and subsequent high operating temperatures caused oil leakage at the bond between the plastic and the lead sheath. Experience with the tape method has been good.

Flexible Jib Crane Has Long Reach

L. SCHUSTER, Maintenance Foreman, Indiana & Michigan Electric Co, Mishawaka, Ind.

A variety of materials handling problems may be solved using a flexible-arm jib crane attachment developed at Indiana & Michigan Electric Co. A safe maximum of 500 lb is lifted with the attachment mounted on a 6000-lb fork-lift truck.

Two arm extensions which each pivot 360 degrees can reach almost 10 ft from the supporting mast. The working height of the hook is about 9 ft above the forks, which can be elevated another 10 ft.

The centerpost and first arm of the attachment are 4-in. heavy pipe, while the second arm is 3-in. standard pipe. Base plates are 20 x 31 in. to provide support for load on forks. Roller bearings in the arm joints are controlled with a small brake.

Formerly, overhead piping, ducts, and cable troughs made hanging of a simple chain hoist difficult. Jobs such as adjusting pulverizer compression springs or removing spring bolts presented the problem of repositioning the lifting device several times.

Farms Near Federal Dam Finally Served

Thirty-two farm families in the east central part of Ferry County, Wash., last month celebrated the arrival of the first electric power service in their area, which is only 30 mi from Grand Coulee Dam, the nation's largest hydro plant.

Service was brought in by Washington Water Power Co after the residents had requested service for a number of years from several public power agencies in the area. WWP has just completed construction of the first section of a 34-mi line that will bring electric service to these farms.

To celebrate the arrival of electric power, about 80 persons, representing each of the 32 families, gathered at the Rogers Bar school for a potluck dinner. The school (above) was among the first buildings to receive electric service. Part of the evening celebration included an instruction course in the operation and maintenance of television sets.

WWP said appliance dealers at Colville and Kettle Falls, Wash., reported a heavy demand from the area farms for a whole variety of electric appliances, including ranges, refrigerators, water heaters and TV sets.

Session Slated on IRS Ad Tax Ruling

The Internal Revenue Service expects to hold a closed staff conference with electric utility company spokesmen to discuss the IRS ruling against tax deductions for a three-year Electric Companies Advertising Program (ECAP) series, as soon as newly-appointed IRS Commissioner Dana Latham is able to get acquainted with his office.

Former Commissioner Russell C. Harrington had agreed to the conference in August, and delayed it until November to give utility attorneys a chance to prepare their arguments. Harrington resigned on Sept. 30, however, and Latham was expected to arrive in Washington in early November. The new commissioner, 60, has been a partner in the Los Angeles law firm of Latham & Watkins.

The closed conference at IRS will give power companies their first opportunity to justify their views that contributions to the ECAP series were a legitimate business expense and, therefore, eligible for federal income tax deductions.

Smog Rule . . .

. . . adopted by Los Angeles to limit burning of fuel oil

The Los Angeles Board of Supervisors Nov. 13 voted unanimously to adopt anti-smog rule No. 62 which restricts the burning of fuel oil during the smog season in the Los Angeles Basin. Specifically, the rule, which has the effect of state law, forbids burning fuel oil having a sulphur content greater than 0.5% and recommends substitution of natural gas. Next year the rule is to be in effect for only six months dating from May 1. Thereafter, the rule will apply seven months.

The Air Pollution Control District, which proposed the rule, said that this would have the effect of removing from, or keeping out of, the atmosphere 350 tons a day of sulphur dioxide and 65-70 tons of other pollutents.

This view is not shared by the Western Oil & Gas Association, leader of the organized opposition. After the ruling, a WOGA spokesman commented: ". . . we have worked many years on smog control and we are naturally disappointed . . . principally because the rule will have no significant effect on smog reduction."

Sulphur-less Oil Costly

It has been estimated that natural gas could supplant some 50,000 b/d of fuel oil. This comes as a bitter blow to West Coast oil companies, who already are suffering from the greatest surplus of fuel oil in 17 years. "We can remove sulphur from fuel oil in the laboratory," said one major oil company official, "but to do so in volume would make fuel oil as expensive as gasoline."

Gas companies, already piping slightly over a billion cfd of out-of-state natural gas into the area have said they'd supply industrial gas requirements. The gas companies are awaiting certification of permits which would enable them to bring 1.7 billion cfd into the basin by the end of 1960.

The strictness of the supervisors' decision on rule 62 was tempered by the insertion of a statement saying that fuel oil can be burned if gas is not available.

RT&E

engineering talent concentrated on transformer

insulation

assures higher overload capacity, extra surge strength

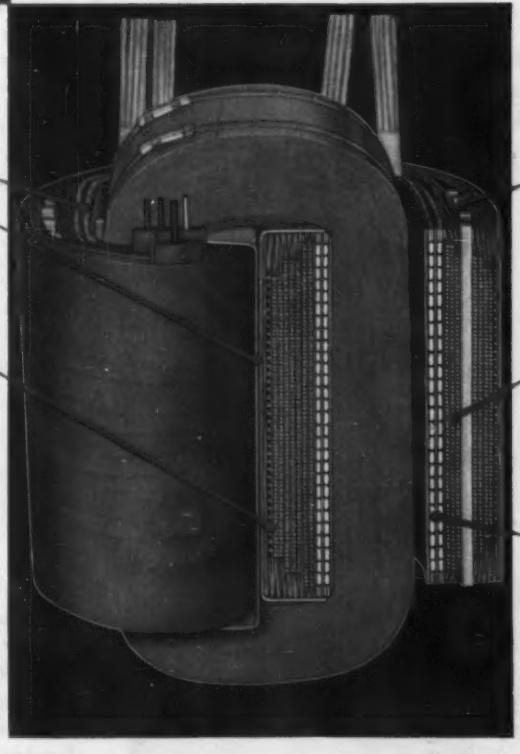
Concentration on distribution transformers only has led RT&E to superior engineering achievement in every phase of transformer development.

One outstanding example of such achievement is clearly evident in R T & E transformer insulation. Because insulation is so important in over-all transformer performance, R T & E impulse withstand levels exceed NEMA requirements by as much as 50%. In addition, R T & E transformers can be safely overloaded without exceeding NEMA temperature rise limitations.

COIL LAYER INSULATION
A minimum of two sheets per layer of high grade 100% pure Kraft electrical paper is used. Thickness choice is such that a maximum stress of 30 volts per mil thickness is attained at high stress points. Major insulation is used as a barrier between primary and secondary windings. Heavy transformer board is used as a barrier between secondary windings and the core.

SURGE PROTECTION
All coils are protected against lightning and switching surges. This is accomplished by means of a space wound layer which resists turn to turn failures and by stepping back the end turns of coil layers and locking them in place with folded paper insulation. This provides a high factor of safety in creepage distances and offers a high resistance to winding to ground or secondary lightning punctures.

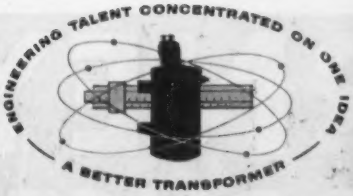
VARNISH
To further enhance the mechanical and electrical strength of the coil, it is immersed in a high solids, high mechanical strength thermosetting varnish that will not soften, dissolve, or affect the cooling oil. After thorough penetration by this varnish, the coils are baked to assure complete curing of varnish and to remove moisture. Final coil drying is done under heat and vacuum in the transformer tank before the oil is added.



INHIBITED OIL
The finest mineral oil, inhibited with DBPC, is used in all R T & E transformers, but only after it has gone through a special drying and filtering process to maintain a dielectric strength of at least 30,000 volts breakdown when tested according to ASTM standards.

TURNS INSULATION
Primary (high voltage) turns are round-wire, insulated with heavy Formvar which has excellent electrical properties, resistance to bending abrasion and heat, and is chemically stable.

Secondary (low voltage) turns use rectangular or square conductors, and are either double cotton or ¾ lap paper insulated. This insulation has excellent varnish absorption qualities which enhance the mechanical and insulating qualities of the coil.



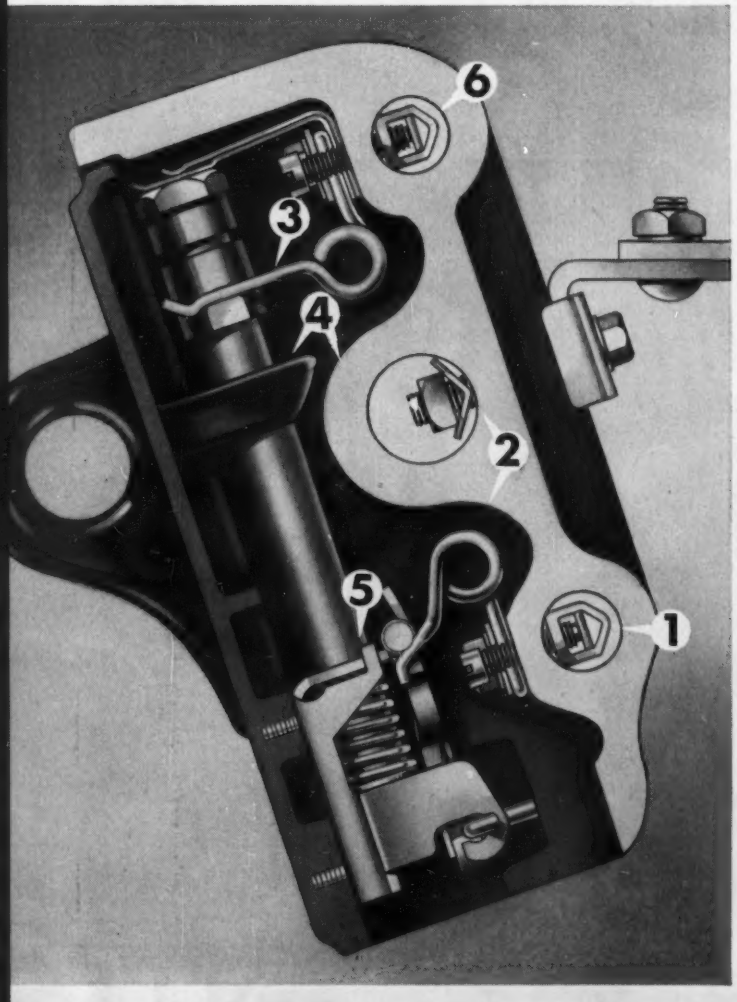
R T & E CORPORATION
WAUKESHA, WISCONSIN • PORTLAND, OREGON

These are the cutouts linemen prefer...

KEARNEY TRIPOMATIC

ENCLOSED CUTOUTS

Check these KEARNEY Tripomatic features . . . each developed and tested to provide the most dependable protection for your distribution equipment.



1. A porcelain wall *isolates* lead-in holes for back connected terminals from the cartridge chamber.
2. Parts fastened with bolts extending through housing . . . cemented attachments eliminated. Contacts and hanger bracket *can't* loosen or pull out of housing.
3. When fuse link blows, resilient spring contacts absorb impact of tube recoil, preventing shock damage to entire cutout. Since the contacts *remain* in adjustment, high contact pressure is maintained even after long service.
4. Engineering of box interior and the collar around the tube restricts gas movement from lower to upper contact. Internal short circuits are prevented.
5. Positive dropout through spring backed toggle mechanism.
6. Fully plated stirrup type terminals. 50 amp. cutouts take No. 2 str.; 100 amp. ratings take No. 3/0 str.

FIELD-TESTED—At KEARNEY's Substation Laboratory of 150,000 KVA Transformer capacity—with a back up power of 445,000 KVA—all equipment is tested under rigorous field conditions. KEARNEY Certified Ratings are actual, proved performance ratings . . . not just theoretical calculations.

for BETTER CONSTRUCTION
SAFER MAINTENANCE

Specify JAMES R. KEARNEY CORPORATION ST. LOUIS, MO. GUELPH, ONT.

The Mark of Quality

KEARNEY PRODUCTS

..they're easiest to fuse...

No nuts, no bolts to tighten! Exclusive construction of the KEARNEY Tripomatic makes it the fastest, easiest cutout to fuse.

Here's how simple it is:

Thread standard buttonhead fuse link through cartridge, and tighten cap . . .

Snub the fuse link cable *over and around* the toggle . . .

Pull cartridge back against its stainless steel spring until toggle arm drops in place over lug, locking fuse cable in place. Mechanical breakage is prevented because correct tension is placed on every fuse link!

JAMES R. KEARNEY CORPORATION

General Offices: 4224-42 Clayton Ave., St. Louis 10, Mo.

Plants at: ST. LOUIS • FAYETTEVILLE, ARK.
SHENANDOAH & CLARINDA, IA. • GUELPH, ONT., CAN.

352RR

Manufacturers News

Aluminum Extruded Tanks Developed by Reynolds

Aluminum distribution transformer housings or tanks manufactured from extrusions, developed by Reynolds Metals Co, were cited for economy and ease of manufacture, installation, and shipping by J. C. Warford, Reynold's manager of the electrical equipment market. He stated that benefits derived from using aluminum for transformer housings will increase in proportion to the size of the transformer. The extruded sectors designed by Reynolds are applicable to 25-kva and larger transformers.

In the illustration J. C. Warford (left) is showing the first housing made from aluminum extrusions to David P. Reynolds, Reynolds' executive vice president in charge of sales.

Some aspects of the use of this metal mentioned by Warford are: (1) Extruded sections can be welded automatically and quickly. (2) Aluminum tanks will mean substantial savings in painting and maintenance costs. (3) Light weight of the aluminum housing will make installation of the transformers on poles easy, safe, and economical. In addition, this means reduced weight load on the poles.

More efficient cooling is expected to be provided by this type of housing, added Warford, both because of aluminum's heat conductivity and the fact that through the extrusion process the fins become an integral part of the tank. Tests indicate that the use of aluminum should also lower noise and magnetic losses.

Pole Star Regulators Now Marketed

A complete line of single-phase step voltage regulators in 27 distribution ratings has been developed by Pennsylvania Transformer Division, McGraw-Edison Co. Both station-type and pole type units are available. The new PSR line offers many design and construction features of the company's Pole Star distribution transformer.

Ratings range from 2.5-14.4 kv, 15-668 amp. The "Mor-Amp" feature permits the regulating capacity to be increased to as much as 160% of rated current, at reduced range. Voltage is automatically regulated over a range of plus or minus 10% in 32 steps of 5/8%.

Pole Star regulators are equipped with either direct-drive tap changer or spring-drive tap changer on regulators of 320 amp and below. Regulators of 320 amp and above are equipped with direct-drive tap changers.

All of the line but 13.8-kv and 14.4-kv regulators and voltage classes above 200 amp are suitable for pole mounting.

The core-and-coil assembly of the Pole Star distribution transformers is duplicated in Pole Star regulators. This includes the patented lap-on-top core, which provides low exciting current and low core loss.

Unit construction of the entire internal assembly, cover, and cover accessories simplifies periodic untanking for inspection. All connections are tested before tanking.

A Peek at an OH System Designed by Rome Cable

An overhead primary distribution system will be introduced shortly by Rome Cable Corp, Rome, N. Y. This system is intended for both utility and industrial distribution circuits ranging from 5 to 15 kv.

Known as TRIMLINE, the system will feature a one-piece, clear plastic spacer which is placed over a messenger and carries up to three polyethylene insulated phase (suggested aluminum) conductors. The spacer is locked at bottom by a ring-type fastener. One spacer is used for voltages up to 15 kv.

Merger Proposed by Sylvania, Gen. Telephone

Directors of General Telephone Corp and Sylvania Electric Products, Inc, have voted approval of a merger. Donald C. Power, president of General Telephone, and Don G. Mitchell, chairman and president of Sylvania, stated that the plan would involve issuance of one share of General Telephone common stock for each share of Sylvania common.

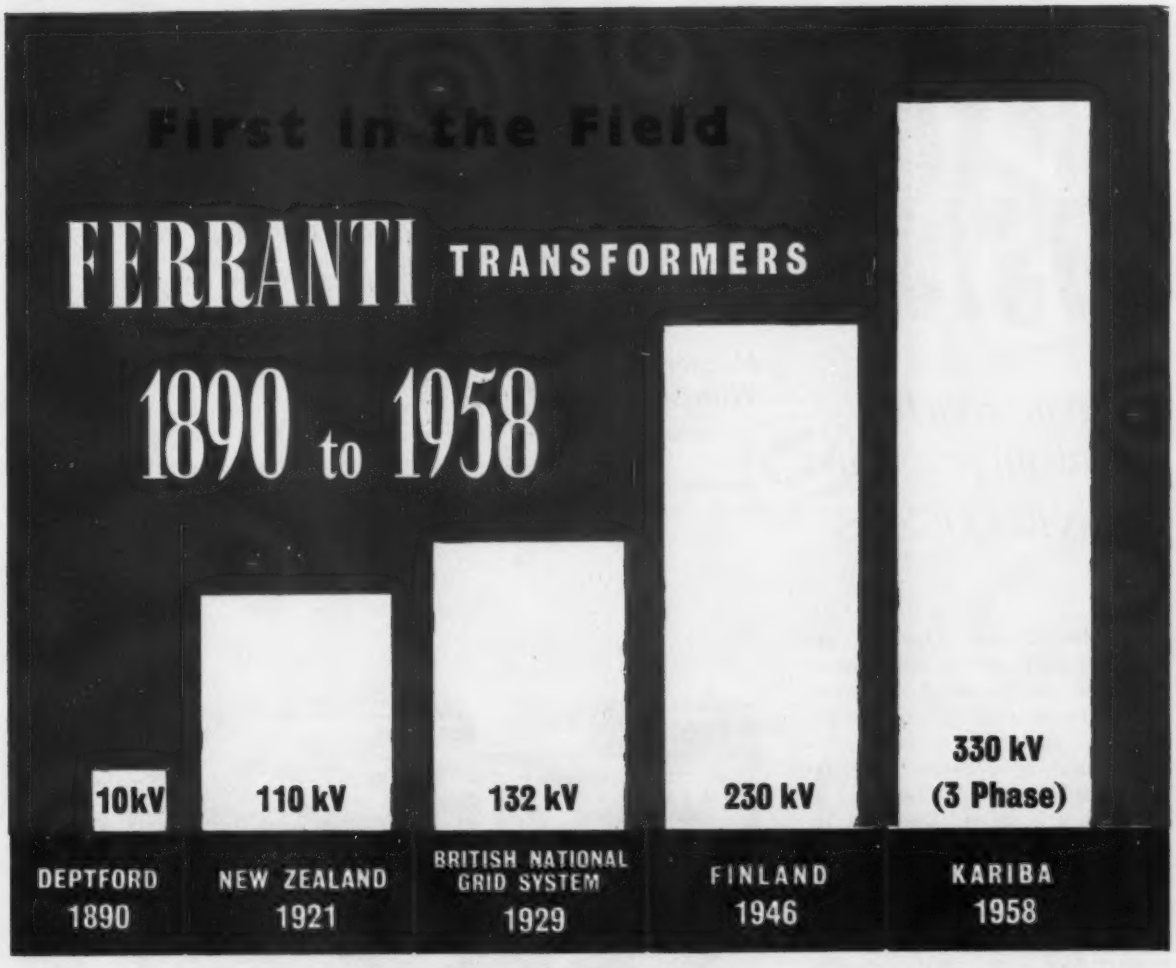
General Telephone's board of directors also voted to recommend

(Continued on page 72)

First in the Field

FERRANTI TRANSFORMERS

1890 to 1958



In the British Electrical Industry, Ferranti transformers are always first in the field thus satisfying the ever increasing demand for electric power.

The skill of Ferranti engineers over a period of more than 65 years has resulted in the award of contracts for the supply of transformers of the highest voltage and rating for the world's largest electric power projects.

Specify* FERRANTI *transformers famous throughout the world

FERRANTI LTD

Head Office: HOLLINWOOD · LANCS · ENGLAND

London Office: KERN HOUSE · 36 KINGSWAY · W.C.2

NEW YORK: Ferranti Electric Inc., 30 Rockefeller Plaza, N.Y. 20

TORONTO: Ferranti Electric Ltd., Hunter Dou-s, Toronto 15

PLANTS

HOLLINWOOD, Manchester 10, England

WYTHENSHAWE, Manchester 22, England

WEST GORTON, Manchester 12, England

GEM MILL, Chadderton, Lancs., England

EDINBURGH, Ferry Road, Edinburgh 5, Scotland

DUNDEE, Kings Cross Road, Dundee, Scotland

CUSTOM CUSTOM

Answers to operating problems:
LINE LOSSES

PROBLEM: On many systems, anticipated load growth will require automatic calculation of line losses in the foreseeable future, but the necessary equipment cannot be justified right now. Present requirements call for computer-control of generation in accordance with incremental heat rates, fuel costs, unit performance, and manual incremental percent-of-power-delivered setters.

SOLUTION: Supplement presently-installed equipment with a Leeds & Northrup dual-function "Desired Generation" Computer (minus transmission matrix which can be added later). Flexible loading consoles now in use will provide automatic control during periods when strict economy loading is not feasible, and when the computer is being used for the solution of anticipated load problems.

The line-loss problem is just one of the many examples of how you can "design" a custom control arrangement using L&N custom components. Talk with our Field Engineers, or write to 4938 Stenton Avenue, Phila. 44, Pa. You'll be taking a profitable —and safe—step into the future.

LEEDS NORTHRUP
Instruments Automatic Controls • Furnaces

Merger Proposed

(Continued from page 70)

to its share owners a change in name of that company to General Telephone & Electronics Corp.

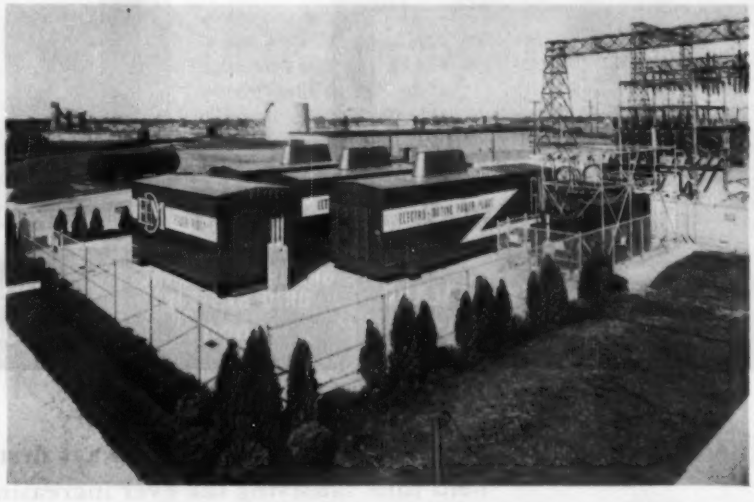
Sylvania, if the plan is approved, will continue operations as a separate corporate entity. It is contemplated that Power will become chairman and chief executive officer of the parent company, and Mitchell will become president.

Magnetic Drives Used With Boiler Feed Pumps

Magnetic drives, reportedly the first in this country used in conjunction with high-pressure boiler feed pumps, will be installed in Units No. 1 and 2 of the Silas C. McMeekin station of South Carolina Electric & Gas Co. Six pumps were supplied by De Laval Steam Turbine Co, Trenton, N. J. The drives were built by Electric Machinery Co, Minneapolis, Minn.

The pumps are 3-stage, double-case, high-pressure, barrel-type units. Each will deliver 1138 gpm of 341-F boiler feed water at 2793-psig discharge pressure against a 6885-ft head.

Speed increasing gears, directly coupled to the electro-magnetic variable speed couplings, will be driven by 2500-hp, 1800-rpm motors to increase speed from 1800 to 5000 rpm, which is the operating range of the pumps.



Diesel-Electric Plant Demonstrated

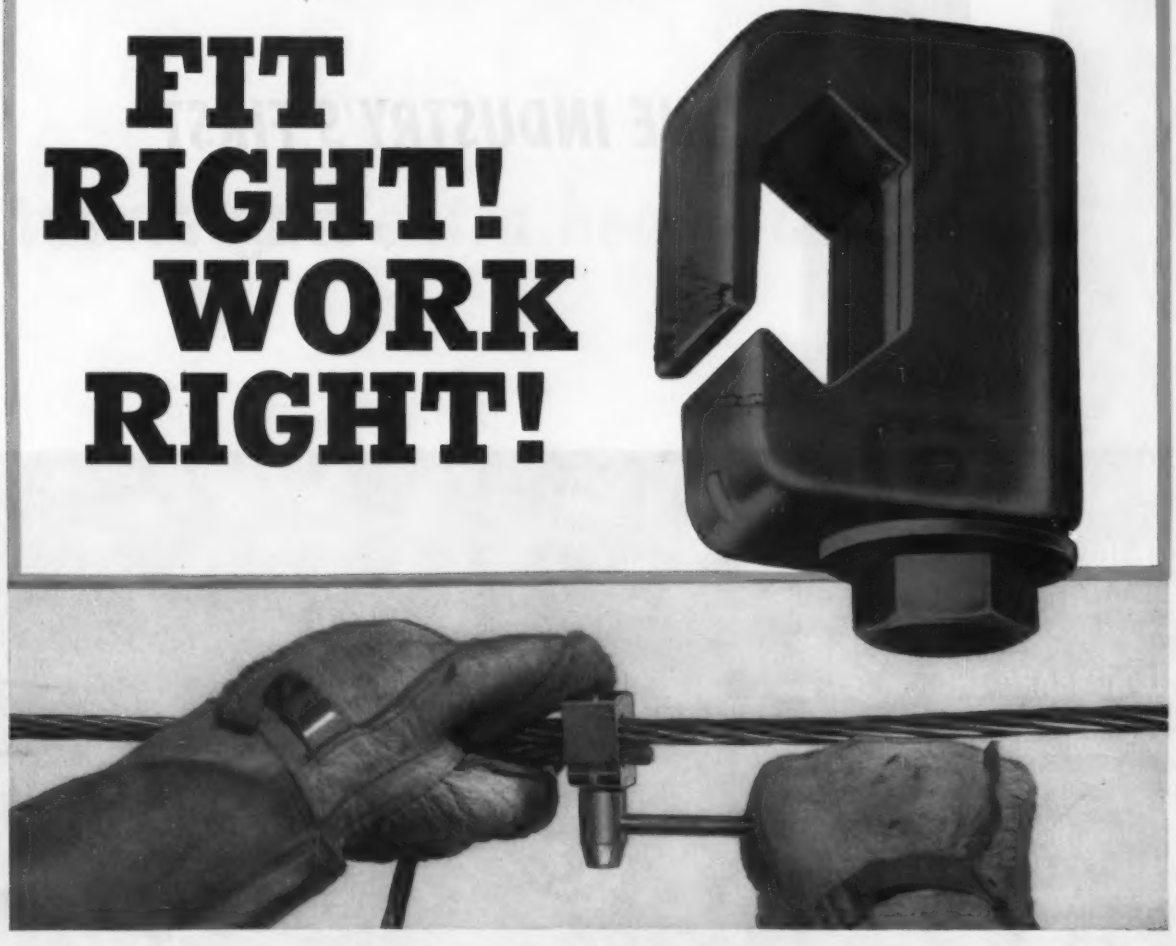
Prototype installation of a 6,000-kw diesel-electric peaking plant for utility service was demonstrated recently at the La Grange plant of Electro-Motive Division of General Motors Corp. The plant, called the M-60, will consist of three 2,000-kw diesel-generator units with a single control board. Although it is portable, the unit is not mobile in the sense of the 1,000-kw EMD unit for rail-car mounting.

Capacity of the prototype unit at La Grange is only 4,200 kw initially. New developments will increase the capacity of each unit to 2,000 kw, bringing the combined installation to 6,000 kw. The installation was complete with landscaping and step-up substation.

Cost of the unit was given as $85 per kw FOB La Grange. Installation cost was estimated at not more than $15 per kw. This led G.M. Vice-President N. C. Dezendorf to state that diesel-electric generating equipment can be supplied anywhere in the U.S. at an installed cost of $100 per kw. The idea of the M-60, said Dezendorf, is to provide low-cost peaking capacity for electric utility systems.

(More Manufacturers News on page 76)

FIT RIGHT! WORK RIGHT!



details make the difference

FARGO "5000" CONNECTORS

Every detail in every Fargo "5000" series connector is right . . . "V" grooves assure perfect conductor alignment . . . greater compressive force . . . conductors completely enclosed . . . high strength . . . vibration proof . . . well rounded corners . . . flat surfaces for back up wrench . . . reusable . . . AND "ONE-PIECE," always threaded, no loose parts.

Fargo's "vise-type" designed connectors are easy to install . . . assure trouble free, long lasting electrical and mechanical connections . . . have a high efficiency for converting a torsional force into a compressive one . . . make a low resistance connection . . . are available from 8 sol. to 1,000 CM . . . *ask your Line Material Engineer for complete details.*

Distributed by
LINE MATERIAL INDUSTRIES
McGraw-Edison Company
Milwaukee, Wisconsin
In Canada, CANADIAN LINE MATERIALS, LTD., Toronto, Canada

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York

FARGO

THE INDUSTRY'S FIRST *single-vent*

THE HUBBARD EHD

THE HUBBARD EHD Cutout is one of the first products to be designed, developed and perfected in the new, completely integrated Hubbard Electrical Research Laboratory. It is here that the single-vent, small-bore operation in the extra heavy duty range—long acclaimed as the most desirable but thought impossible—has now been achieved and thoroughly and conclusively tested.

THIS EMBLEM
—symbolic of the Hubbard EHD, the industry's first Single-Vent, Small-Bore Cutout—is your assurance of *positive and safe* protection against all fault currents from a minor overload to the maximum rating of the EHD Cutout.

SINGLE VENT
EHD
SMALL BORE

HUBBARD EHD
Open Dropout Cutout
Rated—100 amperes continuous current
10,000 amperes at 5.2 kv and 7.8 kv
8,000 amperes at 15 kv

small-bore extra heavy duty cutout

WHAT DOES SINGLE-VENT SMALL-BORE MEAN TO YOU?

The confinement offered by a single-vent, small-bore fuse tube is well recognized as the most efficient condition for fault current interruption. As applied to the Hubbard EHD Cut-out it offers:

POSITIVE PROTECTION throughout the *full range* of fault currents from small overloads to high short circuit currents —without "null operating points." This safe and positive fault current interruption prevents unnecessary service outages.

SAFE OPERATION—the unique recoil design, used in the Hubbard EHD, absorbs the jet-action thrust of Single-Vent operation. A single exhaust envelope is discharged in a small confined cone, contributing to increased safety for personnel and equipment.

Ask your Hubbard representative to show you complete test results, including ultra high speed movies which stop the action of an EHD Cutout clearing an 8000 amp fault current.

HUBBARD

AND COMPANY · 200 South Michigan Avenue · Chicago 4, Illinois

Manufactured in Canada by N. Slater Company, Limited • Hamilton, Ontario

New!

BERMICO® ParQuay conduit used on New York State Thruway

Installing 2" Bermico ParQuay Conduit. Trench was backfilled with New York State specified clean fill

...because "it saved us 50% in material and handling costs," says James Owens,

Installation Foreman, Domizio & Everts, Inc., Yonkers, N.Y.

"The use of this direct-burial bituminized fibre duct with its taper joints and couplings makes it possible to lay it twice as fast as we could lay rigid type conduit," Mr. Owens continues. The installation extends along both sides of a 3½-mile stretch of the Thruway's New England Section, carrying electrical wiring for highway lighting.

Bermico ParQuay (pronounced parkway) is precision engineered from cellulose fibre impregnated with coal tar pitch. It is uniform in quality, with smooth inside bore allowing easy cable pull-through without risk of abrasion. It is highly resistant to acids, alkalies, heat, water and corrosion. Bermico ParQuay's resiliency permits it to follow the natural contour of the highway at laying level!

Why not take advantage of the benefits of Bermico ParQuay Conduit for your next street or runway lighting job, or wherever direct burial conduit may be utilized. Available in 2" and 3" diameters. For specifications and prices consult your nearest Wesco office.

Distributed by WESTINGHOUSE Electric Supply Company

Offices in principal cities

BROWN COMPANY

General Sales Offices: 150 Causeway Street, Boston 14, Mass.

Mills: Berlin, N. H.; Corvallis, Ore.

Turbine Spindle Submitted to High Temperature Test

A low-pressure, bladed spindle for a 325-Mw cross-compound superpressure unit was subjected to an extreme temperature test at Westinghouse Electric Corp's steam division, Lester, Pa. The 5000-psig turbine supply pressure was selected for the tests well above the "critical pressure barrier."

Initially operating at 1150 F, all components are designed for steady service at 1200 F. The unit has two stages of reheat to 1050 F. Nine extraction stages are used, heating feedwater regeneratively to 558 F at rated output. This temperature increases to about 576 F at the discharge of the h-p boiler pump.

The spindle has blades 44 in. long and an over-all diameter of 14½ ft. An intermediate pressure turbine driving the 1800-rpm generator is connected in tandem to the double flow, low-pressure turbine. The generator is believed by Westinghouse to be the first inner-cooled type of machine designed for a speed of 1800 rpm. It is rated at 231,000 kva at 0.85 power factor with 45 psig hydrogen. The superpressure element is connected in tandem with the VHP-HP component to drive the 3600-rpm generator.

Shipment is scheduled to begin about Dec. 1.

A-C Shipment to VEPCO

Allis-Chalmers Mfg Co., Milwaukee, Wis., in shipping a 450,000-lb, 220-Mva supercharged generator stator, required special arrangements for its conveyance. Route was from the West Allis Works to the Virginia Electric and Power Co's Yorktown Station. The stator's weight and large dimensions made it necessary to use a 32-wheel, 500,000-lb depressed-center railroad (Pa. R. R.) car on the first leg of the journey. A ferry route across Hampton Roads (Norfolk-Newport News) was used as an alternate for the second leg of the route, then rail shipment was used again to reach the final destination on the Yorktown peninsula. This VEPCo's No. 2 unit is rated 150 Mw and has a reheat-tandem steam turbine.

ROYAL PRECISION

LGP-30

Electronic digital computer permits load-flow calculations on networks of up to 100 busses and 270 lines at lowest cost

The lowest-priced complete computer you can buy, the versatile LGP-30 saves you time and money by 1) economically solving your load-flow problems; 2) forecasting optimum turbine-generator and boiler usage under varying conditions of system demand; 3) optimizing purchase and sales of power.

Now at work serving numerous electrical utilities, the compact, mobile LGP-30 operates from any convenient wall outlet . . . requires no expensive air-conditioning or installation. It gives you twice the capacity of any computer in its class, yet is by far the easiest to program in basic machine language.

Gives you optimum level efficiency in production, sales, purchase!

Internal components of the LGP-30 have been greatly reduced to insure highest reliability. Operation has been remarkably simplified. Your personnel are quickly trained by Royal McBee without charge. Sub-routines and programs are available—as well as membership in an active users organization. Sales and service facilities are maintained coast-to-coast.

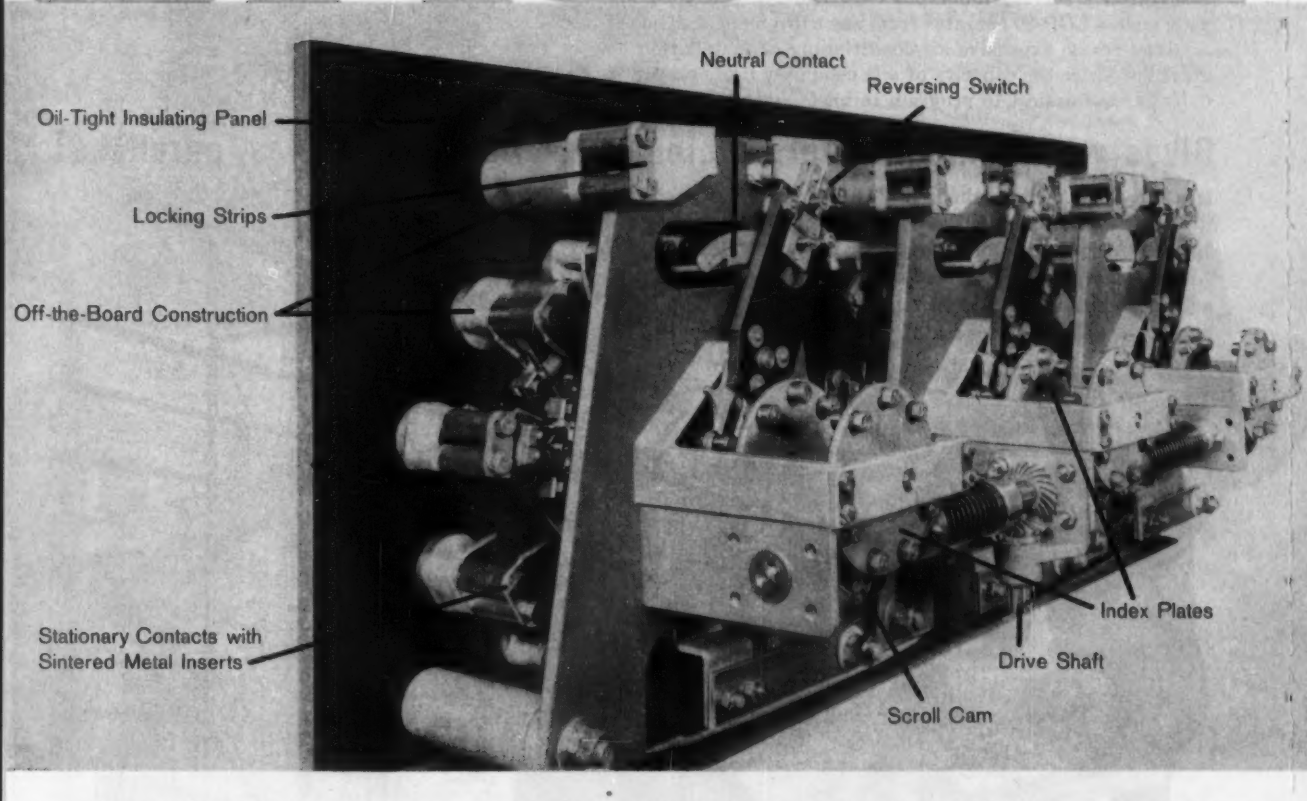
ROYAL McBEE
data processing division

For further information and specifications, write Royal McBee Corporation, Data Processing Division, Port Chester, N. Y.

It's a matter of Cause and Effect . . .

CAUSE

The "550" – a new and better Load Tap Changing Mechanism that can be made for less money.



The development of an entirely new underload tap changer is vital electrical news at any time. But the reduction in the price of the electrical equipment as a direct result of a new and improved design is of *special* significance at this particular time. It is hoped that the combination of these two events will stimulate the purchase of load tap changing transformers in ratings 10,000 kva and smaller.

The facts are simply these: Pennsylvania Transformer engineers have developed, completely tested, and approved an entirely new load tap changing mechanism. Designed around the *direct-drive* principle, it results in a *much simpler*, but at the same, time, a *much more rugged* mechanism that can be manufactured at a lower cost than former spring-drive units. Savings to the user are substantial—averaging between 10 and 15 per cent.

This price reduction presents Electric Utilities with an unusual opportunity to improve service to their customers by purchasing load tap changing transformers more economically and installing them for better system regulation. Referred to as the "550," Pennsylvania's new LTC mechanism has been designed for application on all three-phase, LTC transformers covered by ASA standard C57.12A, on special transformers in equivalent sizes, and in equivalent step voltage regulators.

Qualified sales engineers of Pennsylvania Transformer are alerted to discuss the particular needs of your utility at your own convenience. For appointment write, phone or wire: Pennsylvania Transformer Division, McGraw-Edison Co., Box 330, Canonsburg, Pa. Phone: SHerwood 5-9100.

McGRAW EDISON

PENNSYLVANIA POWER

EFFECT

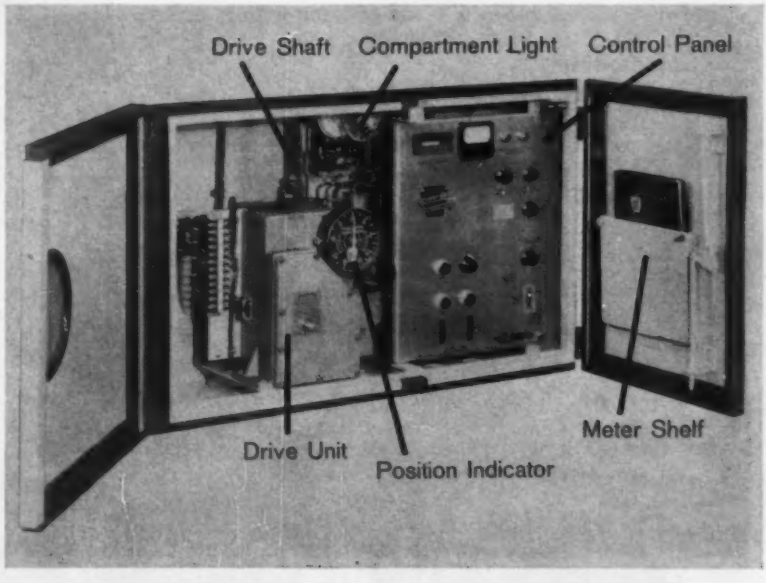
Pennsylvania announces lower prices on tap changing transformers in ratings 10,000 kva and smaller.

In the design of Pennsylvania's new Type 550 LTC Mechanism, maximum consideration was given to the following:

1. Positive indexing with mechanical interlocking
Direct drive of contacts through a scroll cam and index plates inherently insures positive mechanical interlocking. Although the stopping position of the drive is not critical, DC braking of the drive motor is provided to make sure that the contacts stop in the exact position.

2. Efficient arc interruption through controlled contact speed
The movable contacts *start slowly, accelerate rapidly* during interruption, and *close gently* without contact bounce or excessive mechanical shock. This contact speed control is obtained through coordination of the scroll cam design with the design of the gear train.

3. Maximum mechanical life – minimum maintenance
This sturdy mechanism has successfully passed mechanical life tests in excess of two million operations. Particular attention has been given to providing all bolted connections with locking devices.



4. Maximum electrical life – minimum maintenance
All fixed conducting parts in the mechanism are sturdy studs or bus bars rigidly locked in position. Moving contact pressures are individually controlled by coil springs in compression; and rolled copper shunts carry current away from moving contacts. Stand off insulators raise current-carrying parts from high dielectric strength "Pennsylite" to reduce dielectric stress panel on surfaces.

NEW "550" LTC MECHANISM 50% SMALLER AND 75% LIGHTER IN WEIGHT

A comparison of the new 550 mechanism with the unit it replaces shows that in total volume, the "550" is half as large as the former unit. But an even greater difference shows up in total weight. The "550" including oil, weighs only 25% as much as the old unit.

5. Ease of inspection, maintenance and assembly
Hinged doors are provided for air-filled drive/control compartments and oil-filled arc tap switch compartment. Drive and switch compartments consist of subassemblies that are relatively easy to remove and replace.

6. Adaptability to various types of local or remote controls
This includes provisions for hand cranking, automatic control, mounting transmitting unit of remote indicating system, and mounting cam operated auxiliary switches for out-of-step and parallel operation, etc.

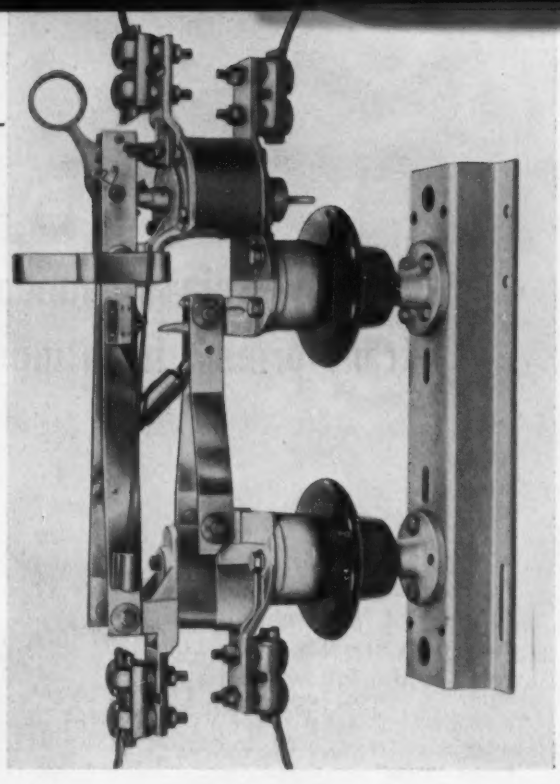
7. Positive oil seals
All gasketed joints in the oil-filled compartment are made by completely retained synthetic rubber gaskets. This includes seal between main barrier panel and main tank, all conductor studs which pass through the main barrier panel, and joints at doors of arcing tap switch.

TRANSFORMERS

PENNSYLVANIA TRANSFORMERS

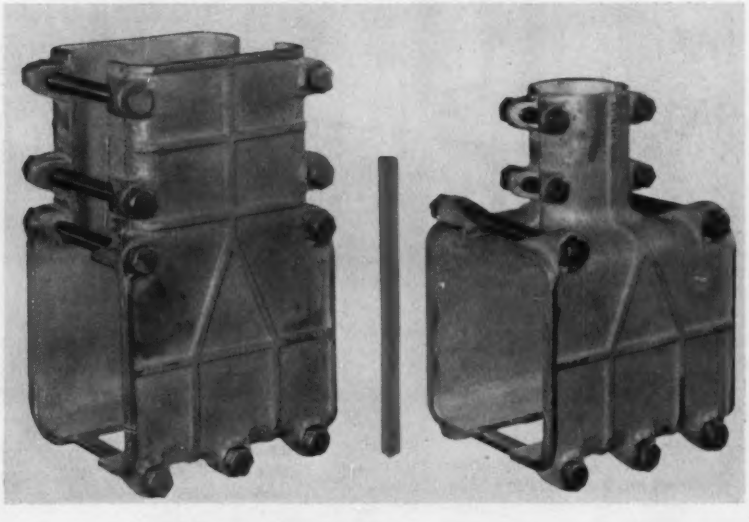
New Equipment

Regulator By-Pass Switch . . .



. . . performs all three steps required in removing a regulator from the line: by-passing, disconnecting, and interrupting exciting current. Pulling down on the pull-ring disengages the blade latch and pulls the shunt bar into by-pass position between the shunt contacts, which are housed in the horseshoe-shaped insulator. With the regulator by-passed, the dual blade continues to travel, opening both disconnects. Then the snap-out arcing horn whips open to interrupt the exciting current. The switch is available in 400 and 600-amp ratings at 7.5, 15, and 23 kv. Blade-jaw and blade-hinge contacts are silver-to-silver.

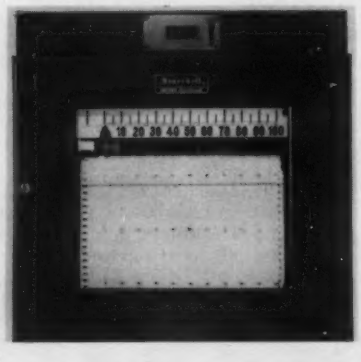
A. B. Chance Co, Centralia, Mo.



Tee Connectors . . .

. . . are manufactured from high conductivity copper alloy with all contact surfaces silver plated. Known as type RP, the connectors were designed for a particular utility installation. One is for 8-in. sq copper bus run and tap, and the other is for 8-in. sq bus run and 3½-in. copper tubing tap. The connectors were designed with heavy ribbing to provide the necessary strength.

Royal Electric Mfg Co, 1122 E 87th St, Chicago 19, Ill.



Integrating Recorder . . .

. . . measures, records and continuously totalizes any linear variable with respect to time. It can be used to measure power line network consumption, continuous weighing systems, and electric current in aluminum pot lines and other electrolytic cell lines. It reads out the integration quantitatively on a six-digit electric counter at a rate of up to 1,000 counts per min.

Brown Instruments Div, Minneapolis-Honeywell Regulator Co, Wayne & Windrim Aves, Philadelphia 44, Pa.

Power Units . . .

. . . employ sealed nickel cadmium batteries to minimize maintenance problems, installation costs and space requirements. They provide an economical source of power

(Continued on page 83)

PREFORMED ARMOR-GRIP SUSPENSION provides a . . .

Pretty Soft Life for a Conductor

. . . cradled in durable neoprene

No vibration fatigue here. The Preformed Armor-Grip Suspension (AGS) eliminates failure by eliminating stress concentration.

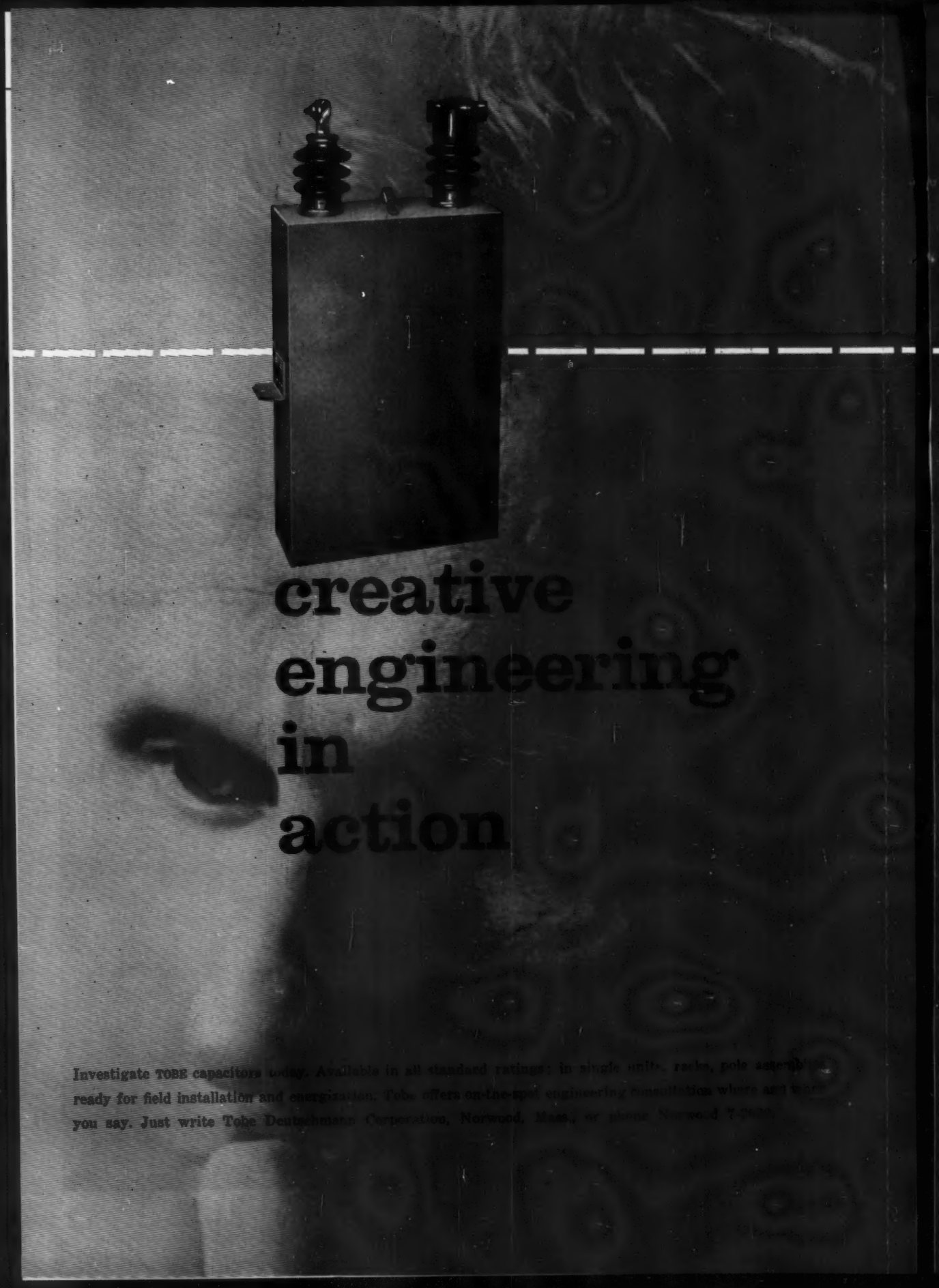
The conductor is cushioned in a split neoprene core, held securely by Preformed rods that never lose their tight grip, and supported in an aluminum housing. Conductor is protected and longitudinal stresses are distributed through the entire length of the rods—not at one point.

Like other Preformed line accessories, the AGS obsoletes bolted hardware. It's easier to apply (no tools needed), costs less, does a better job. You get mechanical strength and electrical protection, and—because of the smooth contour and large diameter of the rod ends—corona emission and radio influence are minimized.

Want to know more about the Preformed Armor-Grip Suspension—or see the application demonstrated? Write PREFORMED LINE PRODUCTS COMPANY, 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable Address: Preformed-Cleveland . . . in 10 years the leading manufacturer of armor rods, dead ends, Guy-Grip dead-ends and other line accessories.

You can look up to **Preformed** T. M.

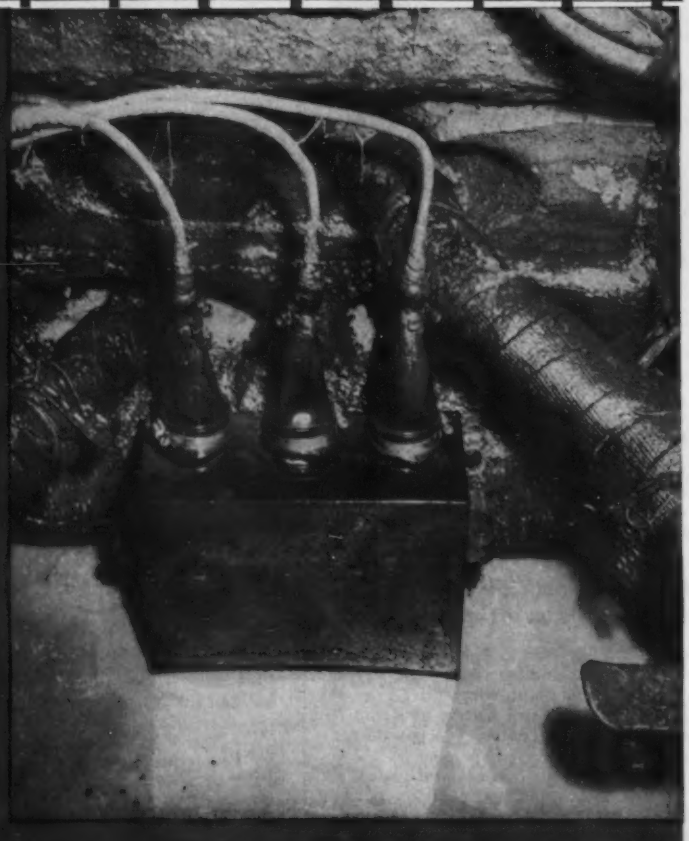
Made in accordance with or for use under one or more of the following U. S. Patents: 2,722,393; 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.



Investigate TOBE capacitors today. Available in all standard ratings: in single units, racks, pole assemblies, ready for field installation and energization. Tobe offers on-the-spot engineering consultation where and when you say. Just write Tobe Deutschmann Corporation, Norwood, Mass., or phone Norwood 7-2600.

LOOK TO TOBE for creative field teamwork to meet your special requirements. Specify Tobe Tempall Capacitors for built-in features that make the big difference in power factor improvement.

• Special clamp arrangement with vibration-proof nylon-insert stop-nut on line terminals • Stainless steel case at no extra cost • Individual testing of every capacitor during every step of assembly and impregnation • Discharge resistors across each terminal group • Losses are consistently lower than specified

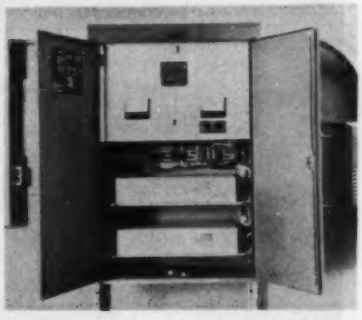


Subsurface type metal-clad switchgear. Ordinarily many of the capacitors used by Consolidated Edison Company are submerged in oil-filled containers and protected by Consolidated Edison Company's patented network of thin subsurface type Tobe fuses (see the small fuse below).

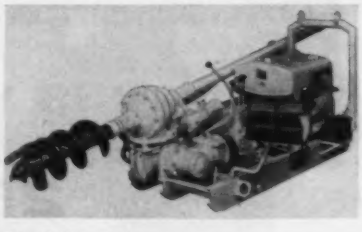
TOBE TEMPALL CAPACITORS

Power Units . . .

(*Continued from page* 80)



capable of delivering current peaks up to 10 times the rated battery capacity. A constant potential charger maintains the battery in a fully charged state at all times. The power units may be used for closing and tripping circuit breakers and switchgear, emergency lighting and tripping and opening relays.
Gulton Industries, Inc, Alkaline Battery Div, Metuchen, N. J.



Mobile Digger . . .

. . . mounts on any ¾-ton vehicle to aid in installations of poles, fence posts, and similar boring operations. It is powered by a 36-hp gasoline engine and will bore a 24-in. diameter hole 6 ft deep. The digger bores angle holes from 45 deg right or left, 30 deg fore, and 90 deg aft of the vehicle. Overall weight is 2,600 lb, and traveling height aboard vehicle is 55 in.
Mobile Drilling, Inc, Indianapolis, Ind.

Pipe Bending Machine . . .

. . . will bend electrical conduit up to 2½-in. diameter, solid bars up to 1½-in. diameter, and angle forms. It is suitable for heavy construction work, plant maintenance, and electrical contractors. The 2500-lb

(*Continued on page* 84)

Only infrequent checks are required for this PlastiCal® control battery installed in the switchroom of the Bridesburg plant of Rohm & Haas, Philadelphia. C&D 60-PCL-11 lead-calcium battery provides instantaneous and dependable power for operating high-voltage circuit breakers shown at right.

Less watering, less charging, 25-year life . . .

. . . sells Rohm & Haas on PlastiCal® battery for quarter-century of dependable switchgear control

No watering in more than a year. Only ⅛th to ⅒th the charging current needed. And a life-expectancy of another twenty-four years! All these outstanding advantages—together with competitive price—make this C & D PlastiCal® switchgear control battery at Rohm & Haas an investment in plant security which continues to pay off for this important chemical manufacturer.

PlastiCal, the advanced-type battery with *lead-calcium* plates, is specifically engineered for control, switchgear, and auxiliary power applications. Compared with conventional lead-antimony plate batteries, PlastiCal will go on and on in full-float service—*for a quarter-century*. "Antimony poisoning" is eliminated. High capacity and high "one-minute rate" guarantee an instantaneous surge of power to open and close critical high-voltage circuit breakers *without fail*.

Add the convenience of the clear plastic, shock-proof case, Saftee-Vent funnel, and other C & D features—and here's a control battery you'll find can't be beat. *For details, write for Bulletin CP-540.*

C&D

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C&D BATTERIES, INC.

of Conshohocken, Pa. ... Attica, Ind.

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Manufacturers of Sure-Dri® Industrial Batteries • Ironclad and Plastiglas® Batteries for Communications, Control and Auxiliary Power • Producers of Autolay* Silicon Chargers

*Trademark

Pipe Bending Machine . . .

(Continued from page 83)

unit is mounted on two trailer-type pneumatic-tired wheels and a castered front wheel. The pump is driven by a 220/240-v, 5-hp electric motor with plug attachment or a 5-hp gasoline motor. The unit is 3 ft wide, 5 ft long, and 3.5 ft high.

Walter P. Hill, Inc, 22183 Telegraph Rd, Detroit 19, Mich.

Hydraulic Boom . . .

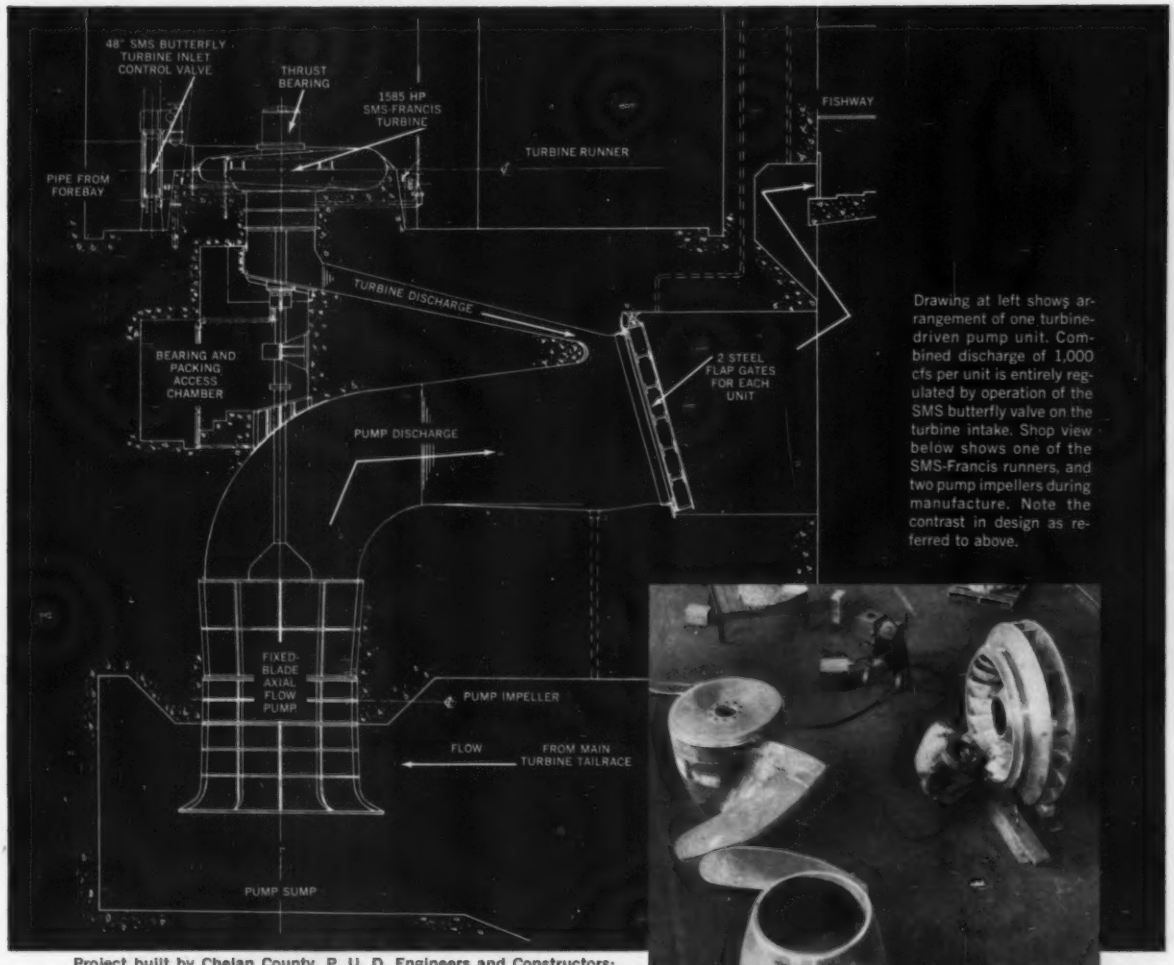
. . . requires only 22 in. mounting space behind a truck cab. Known as the Model 50 Hydra-Lift, the boom lifts up to 5,000 lb and rotates a full 360 deg. The dotted lines in the photo show how the boom can be carried over either the cab or bed of the truck. Three models are available: one with a fixed 12-ft boom, another with a boom that telescopes manually from 12 to 16 to 20 ft, and a third that telescopes hydraulically from 12 to 20 ft.

Pitman Mfg Co, 300 W 79th Ter, Kansas City, Mo.

Drip-Proof Motors . . .

. . . of sleeve bearing design (Type G) are available in NEMA frame series 180 and 210. They are recommended where unusually quiet operation is desirable and the vibration sometimes associated with ball bearings is to be avoided. Typical applications include fan drives for heating, ventilating and air conditioning equipment. Standard mo-

(Continued on page 86)



Drawing at left shows arrangement of one turbine-driven pump unit. Combined discharge of 1,000 cfs per unit is entirely regulated by operation of the SMS butterfly valve on the turbine intake. Shop view below shows one of the SMS-Francis runners, and two pump impellers during manufacture. Note the contrast in design as referred to above.

Project built by Chelan County, P. U. D. Engineers and Constructors: Stone & Webster Engineering Corp., Wenatchee, Washington

SMS Turbine-Driven Pumps Used in Rocky Reach Fishway

In addition to the seven 140,000 HP SMS-Kaplan turbines that will harness the Columbia River at Rocky Reach Hydroelectric Project, three special SMS turbine-driven pump units will provide water for the fishway system. These are SMS-Francis turbines, with a 48-inch SMS butterfly valve on the spiral case inlet. A fixed-blade, axial flow pump is directly coupled to the turbine. Two semi-buoyant structural steel flap gates prevent reverse flow from the fishway.

An interesting contrast is present in this arrangement, in that a very low specific speed turbine runner (normally used for 800 to 1000 foot heads) operating under 60 to 90 foot head is used to match the speed and drive a very high specific speed pump impeller, designed for pumping a 4 to 5 foot, pool to pool head. This simplified arrangement eliminates the multiplicity of conversion losses inherent with a motor drive and results in increased overall efficiency and simplification of controls.

Current bulletins describing SMS hydraulic turbines, pumps and accessory equipment, as used in the above installation, are:

#152 – Francis Turbines • **#163** – SMS Water Control Gates • **#164** – Complete Valve and Remote Control System • **#165** – Adjustable and Fixed Blade High Capacity Axial Flow Pumps

Write S. Morgan Smith Company, York, Pennsylvania for further information.

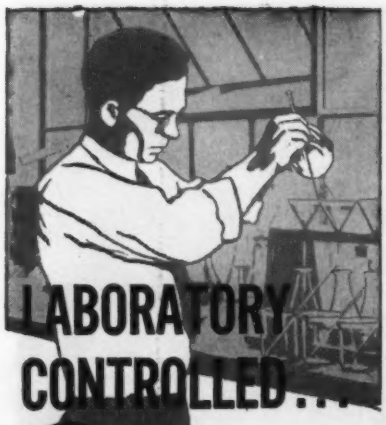
More Power To . . .

S. MORGAN SMITH

HYDRODYNAMICS

AFFILIATE: S. MORGAN SMITH, CANADA, LIMITED, TORONTO

Rotovalves • Ball Valves • R-S Butterfly Valves • Free-Discharge Valves • Liquid Heaters • Pumps • Hydraulic Turbines & Accessories



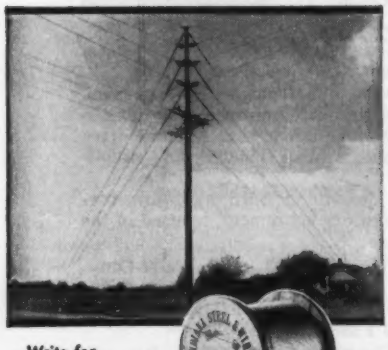
LABORATORY CONTROLLED . . .

Crapo

GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.



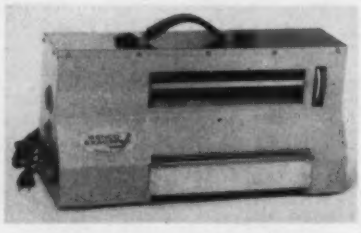
Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana

(*Continued from page* 84)

tor ratings from ½ to 7½ hp are included in the series.
Allis-Chalmers Mfg Co, Milwaukee 1, Wisc.



Copying Machine . . .

. . . is bantam size and completely portable. Called the Genco PORTA-FAX, the machine weights 18 lb and measures 18 in. long x 6 in. deep x 10 in. high. It reproduces from all colors and ball point pen. The PORTA-FAX handles sheets up to 9½ in. wide, producing 60 to 90 copies per hour.
General Photo Products Co, Inc, Chatham, N. J.

Star Drill . . .

. . . automatically sucks in any dust and chips it creates when drilling in concrete, stone, marble and other hard materials. Dust and chips are sucked through hollow drilling steel into the tool and out ports in the back head into three plastic dust-collecting and air filter tanks. The drill rotates automatically during drilling. It is suitable for electrical pipe and conduit drilling.
Thor Power Tool Co, 175 N State St, Aurora, Ill.

ALLIS-CHALMERS

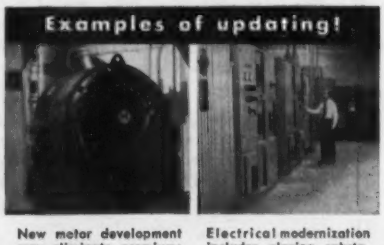
Plan to stay ahead... MODERNIZE!

ALLIS-CHALMERS

NEW brochure of ideas for modernizing

This booklet is based on the premise that modernization can start anywhere in your plant. It can be a single machine or operation . . . a better way of getting variable speed . . . a faster way to braze . . . or a newly available replacement. In fact, this type of updating is far more common than the sweeping change.

Get a copy of "59 ideas for modernization in '59" from your nearby A-C office or write Allis-Chalmers, Industries Group, Milwaukee 1, Wisconsin.



New motor development may eliminate premiums you've been paying for specially protected motors.

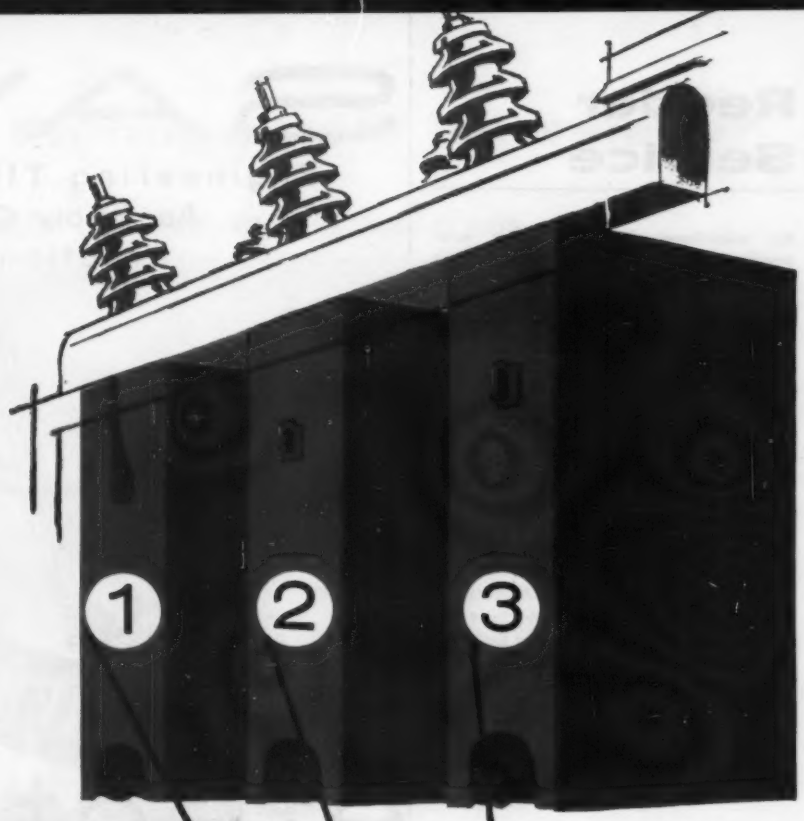
Electrical modernization includes placing substations close to machines being served.

ALLIS-CHALMERS

A-5850

Plan to stay ahead... MODERNIZE!

3 tanks are better than 1



for positive protection with outdoor distribution breakers

Ratings:
14.4 and 23 kv,
100 and 250 mva

Just like big breakers, there are 3 tanks for complete phase isolation. This means positive protection against internal phase-to-phase flashover.

Extra protection is only one of the many benefits you obtain in 3-tank design. Maintenance is easier; tanks are smaller and easier to handle; and oil contamination is reduced.

There is no extra cost for this 3-tank breaker with big-breaker features.

For the complete story ask for Bulletin 71B7946. Call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5622

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Royal Electric .....Connectors ☐
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Gulton .....Power Units ☐
Mobile Drilling .....Digger ☐
Walter P. Hill.....Pipe Bender ☐
Pitman .....Boom ☐
Allis-Chalmers .....Motors ☐
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Thor .....Star Drill ☐

MANUFACTURERS LITERATURE

Code No. .....

(Requests are made from code numbers on page 96).

OTHER

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Manufacturers Editor
Electrical World
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NOVEMBER 24, 1958

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Engineering **TIME**
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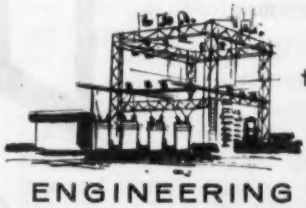
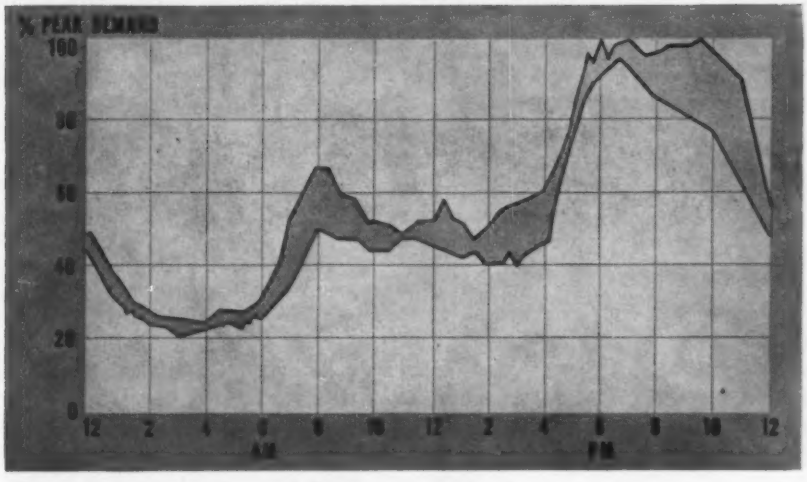
Our new Engineering Bulletin on Modified Erecticon is yours for the asking—send for it today. No obligation.



the charles e. schuler
ENGINEERING COMPANY
111 Cambria Street, Newark, Ohio

Report on
Load Research

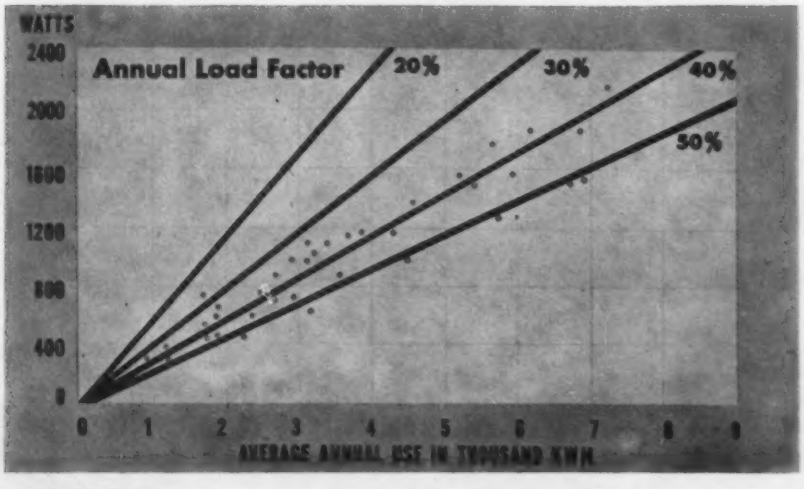
Residential Load—Winter—Average Weekday—All Areas



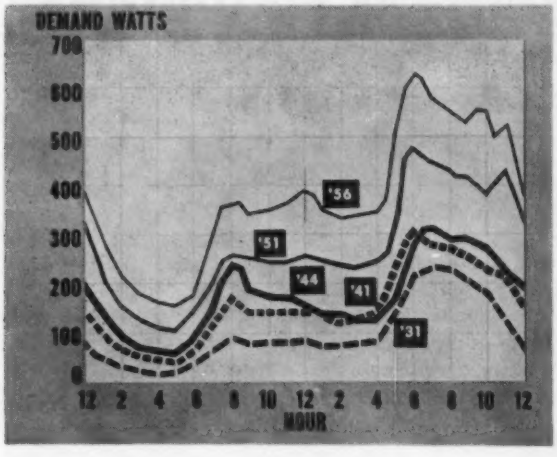
AEIC Studies Residential Load

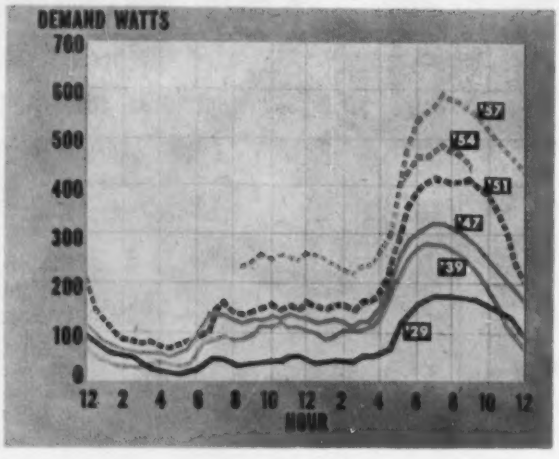
Residential kwhr use patterns for groups of customers without electric ranges or water heaters are much the same in different parts of the U. S., and relationships between demand and usage are remarkably consistent from area to area. These are among the findings of the Load Research Committee of the Assn of Edison Illuminating Companies, reported at AEIC's annual meeting by the committee's chairman, B. P. Dahlstrom of Public Service Electric & Gas Co.

Plotting together the upper and lower limits of residential load curves for the average winter weekday for groups of customers from urban and suburban Philadelphia, Detroit, Poughkeepsie, N. Y., and eastern Illinois showed that they fell within a narrow range, as can be seen from the chart above. The consistent relationship between demand and kwhr use, regardless of location, shows up in the chart below. Based on diversified average weekly demand, load factors



Residential Load Studies—Philadelphia Electric Co and Public Service Electric & Gas Co

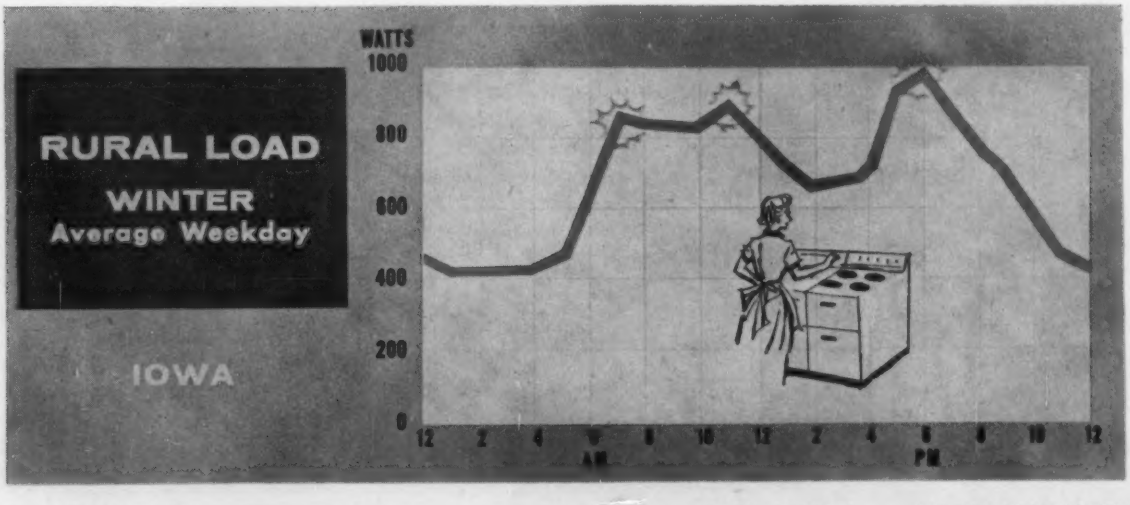




average between 45% and 50%. Based on diversified maximum demand, the load factors would range from 35% to 40%. There is a slight general increase in annual load factor with increasing kwhr use, but this does not mean that increasing usage always improves annual load factor. Some added loads raise load factor, while others pull it down.

To show the overall effect of changing load characteristics over the years, the committee pointed to load curves of the entire residential class (per customer) of Philadelphia Electric Co and Public Service E&G. Note how the growing saturation of electric ranges has contributed to development of a class peak around supper time—6:00 pm in Philadelphia, slightly later in the PSE&G service area. The growth in Philadelphia's water-heater load is reflected in the upsurge in class demand at the end of the "off-peak" period at 10:30 pm, and the introduction of a second "off-peak" cycle beginning at 9:00 pm shows in the 1956 load curve.

Farm load curves are similar. A study of rural loads in Iowa reflected the fact that electric service to farms is used predominantly for domestic purposes, and more rural load curves exhibiting typical residential characteristics were developed from studies in Illinois and Michigan. These curves all showed three



peaks—coinciding with meal times—with morning and noon peaks more pronounced in farm areas than in cities—probably because fewer city customers are at home for these meals. In the Detroit rural test area, a substantial saturation of controlled water heaters provides a fourth peak after 10:00 pm.

WATER HEATING: **On the subject of water-heating load,** a special subcommittee came up with several interesting conclusions. The subcommittee found that shifting from controlled to uncontrolled water heating normally increases average customer use. It also eliminates the problem of peak loads at the start of the charging period and improves the daily load factor of the water-heating load. But it creates coincident demands on the average weekday of from 0.5 to 1 kw per heater during the critical morning (9:00-11:00 am) and evening hours (6:00-8:00 pm), which introduces additional capacity responsibilities for the residential class of service on both distribution and bulk supply systems. Other findings:

- **Advancing the starting time of an off-peak charging period** for controlled water heating from 11:00 pm to an earlier hour is of no appreciable benefit to the consumer or the utility. The maximum demand at the beginning of the cycle is not reduced, and its basic load pattern is unchanged. On the other hand, deferring the start of an off-peak period tends to reduce total load on a residential circuit and may also reduce voltage drop during the early evening hours. If the off-peak period exceeds eight hours, however, morning loads for the total residential class may become the peak for the day.

- **Addition of a "noon booster" period** improved the customers' supply of hot water, but at the expense of a secondary water-heater peak equivalent to nearly 80% of the day's maximum demand.

- **Introduction of artificial diversity by use of "split cycle" control** reduced maximum load at the start of the charging period by as much as 40% on an average weekday, and can shift a late evening peak to midnight or 1:00 am.

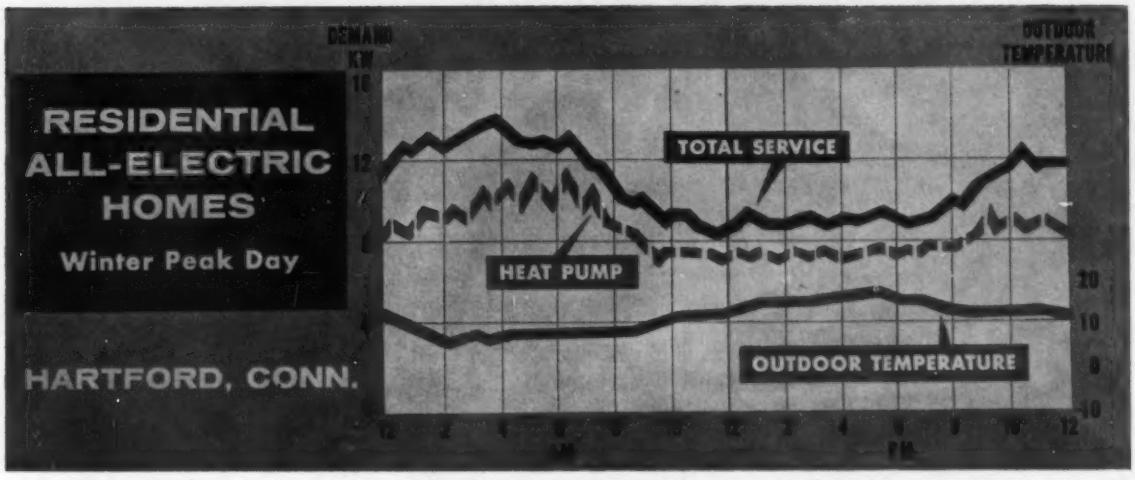
APPLIANCES: **A special subcommittee on residential lighting and appliances** reported studies of clothes dryers, automatic clothes washers, dishwashers, freezers, and ranges. The subcommittee's data contradicted the thesis that the advent of the electric home laundry would spread clothes washing over the entire week. It appears that housewives continue to do more washing on Monday than on any other day. Much of the data on appliances came from studies by Texas Power & Light Co reported previously in EW (Aug. 11, 1958, p 40). Other highlights:

- **Group maximum demand of high-speed dryers is not much different** from that resulting from standard-speed dryers, a test in Illinois showed. High-speed dryers, while they have higher individual demands, also have greater diversity.

- **Group maximum demand for automatic clothes washers hits around 11 am,** about an hour earlier than that of the dryer load. The energy use of automatic clothes washers tested in Texas amounted to 89 kwhr annually, with very little monthly variation. (Summer months averaged 7.0 kwhr, and winter months averaged 7.3 kwhr.) Washer demand is about 10% of dryer load, and has correspondingly less effect on the customer's maximum demand.

- **Dishwasher load complements the electric range load,** the Texas studies showed, with demand peaks at 2:00 pm and 8:00 pm. Annual energy use of dishwashers studied averaged 274 kwhr, and was very uniform from month to month with a high of 25 kwhr in winter and a low of 21 kwhr in summer. It is interesting to note that the dishwasher used three times the kwhr of the clothes washer.

HOUSE HEATING: **The Subcommittee on Electric House Heating** drew data on resistance heating from Detroit, Buffalo, Springfield, Ill., and Belleville, Wis.; on heat pumps from Detroit, St. Louis, Washington, D. C., Portland, Ore., Corpus Christi, Tex., Hagerstown, Md., Petersburg, W. Va., Greensburg, Pa., and Lawrence, Kan.; and on all-electric homes from northern Indiana—southern Michigan, Virginia

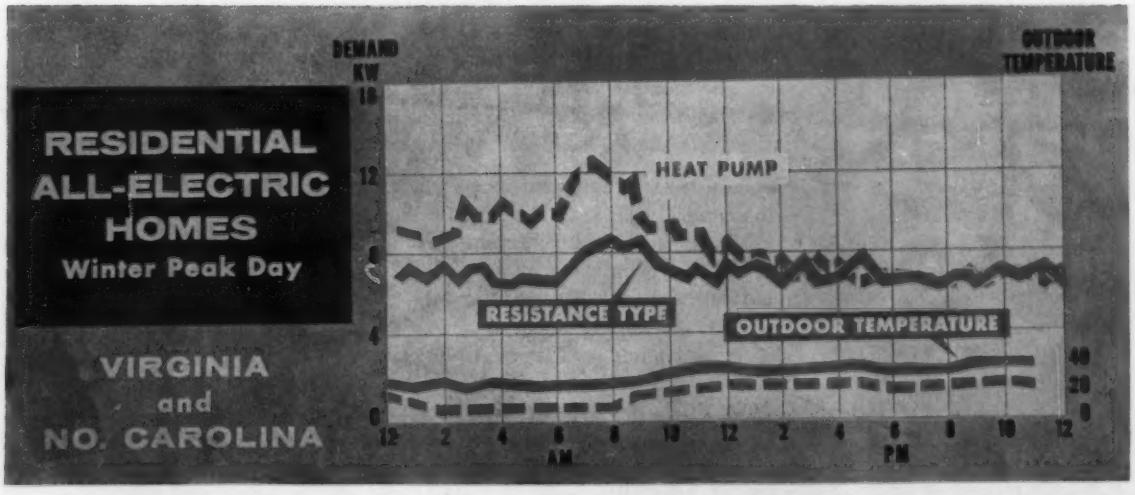


—North Carolina, Hartford, Conn., and Erie, Pa. Although some of the data is scanty, the subcommittee was able to extract some interesting conclusions:

• **House heating dominates the load in the all-electric home,** as can be seen in the chart above which shows the load curve of a Hartford home with heat pump.

• **The ratio of maximum diversified demand to rated capacity** was found to be lower for resistance heating systems than for air-to-air heat pumps with supplementary resistance heating elements, within the limits of the available test data. Probably this is because heat pumps are normally operated from a single thermostat, while resistance heating systems operate from several—building up diversity within the heating system. This shows up in the chart below, where heat pumps produce the higher morning load. On the other hand, the normal annual energy use (for heating) per kw of rated capacity is considerably less with the heat pump than with resistance-type heating systems, reflecting the coefficient-of-performance factor in the heat pump.

• **Annual load factor is about 20% for resistance heating, 16% for heat pumps,** based on the test data. This stems from the facts noted above. The load factor for all-electric homes, however, was found to be approximately 25%—whether equipped with a heat pump or resistance heating. This compares with annual load factors between 35% and 40% for the entire residential class.



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Underwriters' Type SE, Style U, 75° C. Operation

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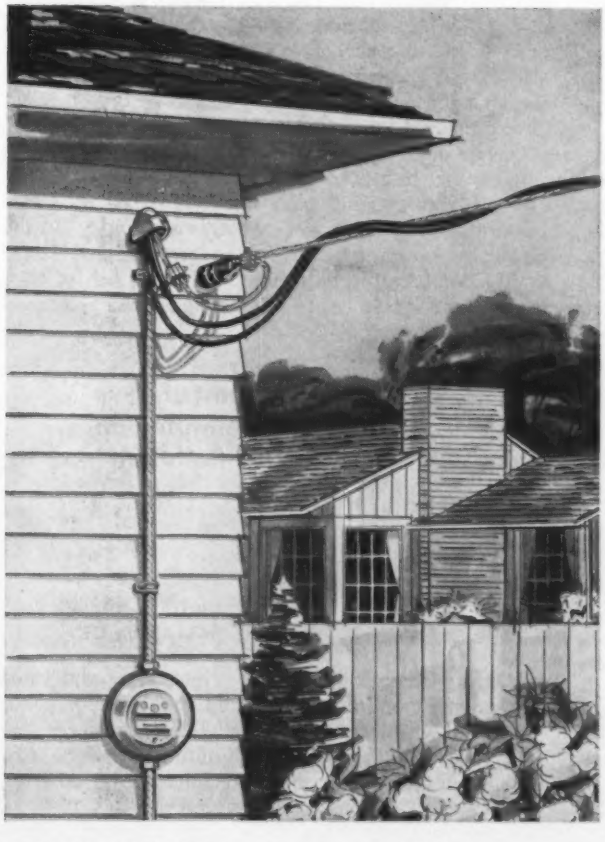
100	20	2	5.50	3	9.10	3.60	40
.....	40	2	11.00	3	18.20	7.20	40
.....	60	2	16.50	3	27.30	10.80	40
150	20	2/0	9.46	1/0	21.48	12.02	56
200	20	4/0	12.80	3/0	30.28	17.48	58

NOTE: Based on prices in effect as of September 15, 1958.



Check the table... at today's prices, braided aluminum SE-U saves you money over copper right down the line!

Note that the cost of #2 aluminum SE-U is *40% lower* than #3 copper SE-U. With the trend toward larger sizes, savings with aluminum become even greater—up to 58% for 200 ampere service! Neoprene jacketed aluminum cables offer similar savings.

FREE BROCHURE GIVES YOU THE FACTS

Our new, free brochure, *"KW Service Entrance Cable,"* points out the distinctive characteristics of both braided and neoprene jacketed aluminum cable, and fully explains why this cable offers definite advantages over copper.

It also describes and illustrates applications of SE-U Cable, as well as Single Conductor in Conduit, and contains a list of manufacturers of accessories for both applications.

Get your free copy of this informative 8-page brochure now. Mail the coupon!

KAISER ALUMINUM

IF IT CARRIES CURRENT, KW *CARRIES IT!*

Kaiser Aluminum & Chemical Corp.
Dept. 953
919 N. Michigan Ave., Chicago 11, Ill.

Please send your free brochure, *"KW Service Entrance Cable."*

Name_____

Address_____

City_____ State_____

EWo

in placement of turbine generator and boiler business has been a source of trouble for the manufacturers and they have made continuing requests for improved ordering procedures. . . . one way to avoid peaks in manufacturers engineering is to order in advance; permit the manufacturers to proceed with engineering and drawings, but reserve the right, a year hence, to release the procurement of material and fabrication, or to withhold such release for another year."

"Our report to you last year stated that improved methods of testing rotor forgings for large turbines and generators resulted in the rejection of a high percentage of these units. A remarkable improvement in this situation has occurred in the past year due to the increasing use by steel manufacturers of the vacuum method of pouring ingots and closer control of other metallurgical and forging processes."

Report of Committee on Electric Switching and Switchgear

R. G. MEYERAND, Chief Electrical Engineer, Union Electric Co

"One area of difficulty has been a source of concern to the committee in recent years. This has been the rather sizeable percentage of switchgear defects chargeable to the manufacturer found on metalclad switchgear rated 2.5 kv and above. . . . we are happy to see that the latest report for the year 1957 shows continued improvement in this area."

"A new subject now receiving your committee's attention is the NEMA proposal for revised temperature limits in power circuit breaker equipment. This proposal, if adopted, would have far-reaching effects on the design of circuit breaker equipment. The subject has been referred to AIEE for preliminary action since it bears basically on the technical feasibility of elevated temperatures and affects existing AIEE standards."

Report of Committee on Power Distribution

J. A. TENBROOK, Chief System Planning Engineer, Philadelphia Electric Co

"Basic research, accompanied by improvements in manufacturing techniques, has progressed to the point where we confidently foresee the early availability of cable in the 345 to 400 kv range that will be suitable for operation under American conditions of loading and will satisfy our standards of service reliability."

"The High-Voltage Field Testing Program is now well organized and moving, . . . financing has been completed and the contact with Cornell University to construct and operate the High-Voltage Test substation is nearing completion of negotiations."

"The types of cable to be offered for test are now known. General Cable Corporation and the Okonite Company will furnish pipe-type cables. Phelps Dodge Copper Products Corp will offer a high pressure, oil-filled aluminum sheath cable; Anaconda Wire & Cable Co a low pressure, oil-filled cable of the Pirelli type."

Report of Meter and Service Committee

J. S. LINEBACK, Supt. Electric Meter Dept., The Cincinnati Gas & Electric Co

"Today we believe modern electric meters will operate for life (estimated to be 30 to 35 years) without maintenance or adjustment under normal service life."

"Of the 48 states, 30 have utility commission regulations requiring that electric meters be tested on periodic-testing schedule. Based on reliable estimates, 65% of the total meters in service are located in these 30 states. Indications of progress can be seen from the fact that during the past two years, 5 of the 30 states have permitted, on a trial basis, random sample testing of meters in service."

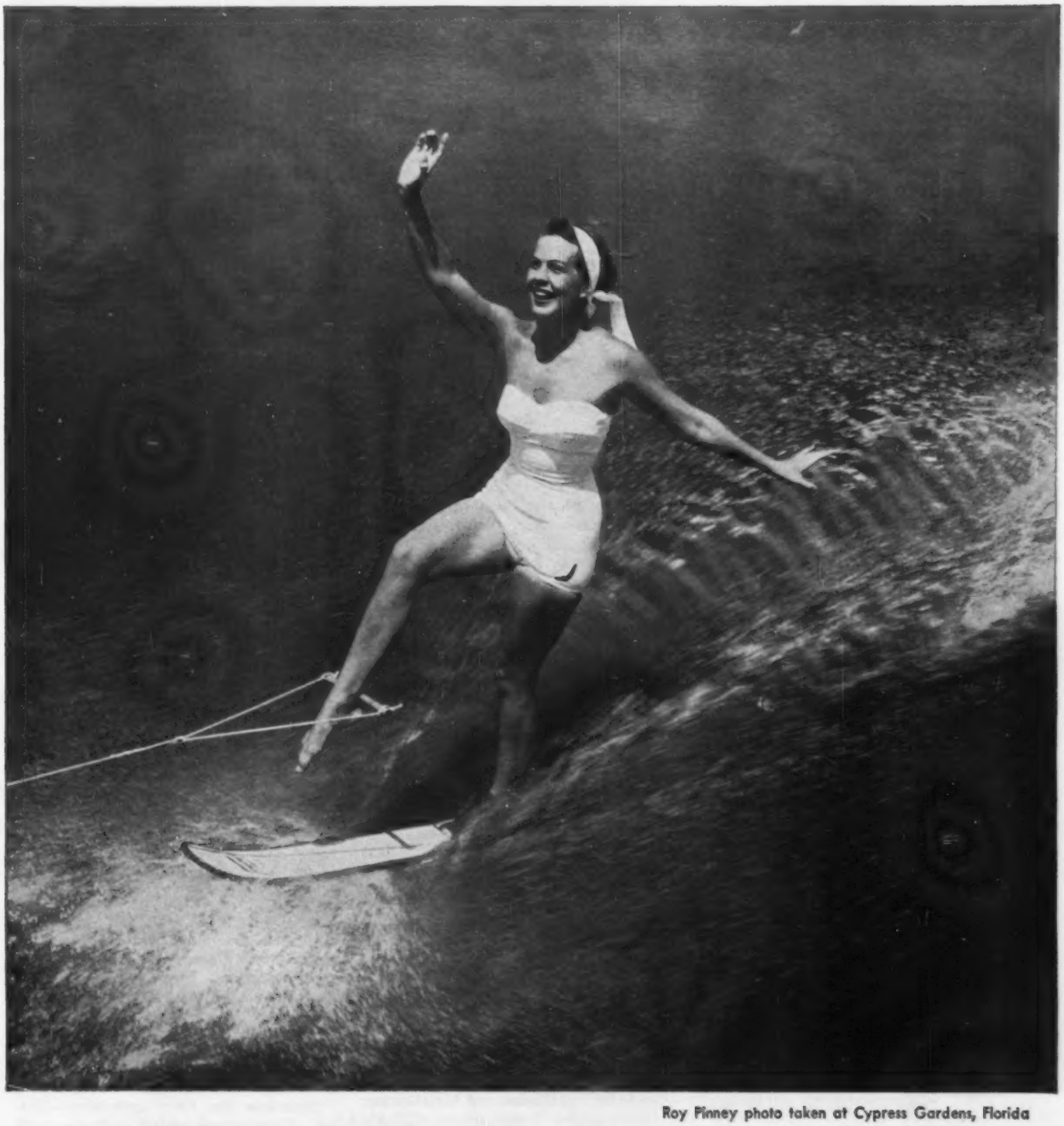
"Just this past September a sixth state, New York, approved an optional plan which is based on meter performance. While not strictly a sample testing procedure, on large systems this plan does provide for a very considerable reduction in the number of tests required for those types of meters showing a good performance record."

Report of Committee on Air Pollution

G. V. WILLIAMSON, Vice President, Union Electric Co

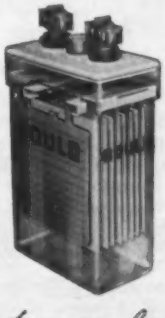
"During the past year, further interesting and valuable progress on the control and reduction of solid, gases, and visible plumes from oil-fired furnaces has been made by the Southern California Edison Co. Through tests on two pilot precipitators of differing

(Continued on page 104)



Roy Pinney photo taken at Cypress Gardens, Florida

UNIQUE PERFORMANCE . . .



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GOULD PLANTÉ
The Aristocrat of
Stationary Batteries

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Dependable day in, day out operation; long, trouble-free life—this is what you get with a GOULD battery. And, in addition, GOULD field engineers will help you solve application problems, establish preventive maintenance procedures, and make routine calls to insure maximum pay loads—at no extra cost to you. Check your local GOULD representative for details on this unique service. Gould-National Batteries, Inc., Trenton 7, N. J.

More Power to you from Gould

Always Use Gould-National Automobile and Truck Batteries

Manufacturers Literature

To request literature, use code numbers to fill in Reader Service form on page 88

GENERATION

REACTIVE SUPPLY, system planning. Pub. No. 58-9 published by Edison Electric Inst, 750 Third Ave., New York 17, N. Y. 16 pages. Prices: 50¢ to members and their employees; $1.25 to non-members in U.S.A.; $1.35 to foreign countries; all prices include mailing charges. B1

WATER COOLING TOWERS, Recirculation, 12-page publication by the Cooling Tower Institute, describes a 7-yr research program for industrial water-cooling towers. Price $1. Also available: Appendix with test data from 30 operating towers. Cooling Tower Institute, 420 Emerson St., Pala Alto, Calif. B2

TRANSMISSION

POLE LINE HARDWARE. Catalog covers distribution crossarm gains, transmission hardware, spacer type aerial cable clamps and guy hooks. Malleable Iron Fittings Co, Branford, Conn. B3

SUBSTATIONS AND TOWERS: Engineering and production facilities for manufacture of electrical distribution and transmission substations and towers are described in 6-page brochure Charles E. Schuler Engineering Co, Newark, Ohio. B4

COMPRESSION-TYPE CONNECTORS, Straight, for insulated copper conductors . . . Specifications (TD-161) published by Edison Electric Inst, 750 Third Ave., New York 17, N. Y. B5

LIGHTNING ARRESTERS . . . new international standard published by the International Electrotechnical Commission. "Recommendations for Lightning Arresters, Part I: Non-Linear Type Arresters," goes beyond American Standard C62.1 and furnishes limiting performance characteristics. Bul. 99-1 $3.20 each, available through American Standard Assoc, Dept PR 14, 70 E. 45 St., New York 17, N. Y. B6

DISTRIBUTION

TRANFO-UNIT, complete, single package transformer unit, with wide selection of components. Bulletin 12004-A, 4 pages. Indoor or outdoor construction. Ratings: 45-3,000 kva; primary—2.4-14.4 kv; secondary—120/208-600 v. I-T-E Circuit Breaker Co, 1900 Hamilton Sts., Philadelphia 30, Pa. B7

KEARNEY PUBLICATIONS: James R. Kearney Corp, 4236 Clayton Ave, St. Louis 10, Mo.:

Distribution Cutouts . . . Catalog 1A shows full line of open-type drop-out distribution cutouts rated 5.2 to 34.5 kv with Type G double venting or Type GX pressure controlled venting cartridges. B8

Compression Connectors . . . Catalog 13 lists Squeezon compression fittings for ACSR, aluminum, and copper open-wire distribution connections, plus mechanical and hydraulic installing tools. B9

CABLE: Differences distinguishing one type of portable electrical cable from another are pointed out in a 6-p brochure. Basic construction of a Bronco 66 electrical cable is described and condensed tables give data frequently needed by electrical engineers. Western Insulated Wire Co, 2425 E 30th St, Los Angeles 58, Calif. B10

SUPERFORMED ACCESSORIES for overhead line construction. Comprehensive catalog of wire helix formed material, trade name "Superformed," for conductors and static wires. Ring-binder. Fanner Mfg. Co, Brookside Park, Cleveland 9, Ohio. B11

GE PUBLICATIONS: General Electric Co, Schenectady 5, N. Y.

Metal-Clad Switchgear . . . rated 2.4 to 13.8 kv, 75 to 1000 Mva, indoor and outdoor. Bulletin GEA-5664E, 40 pages, describes complete line. B12

Flip-Open Fuse Cutouts . . . Design features and application data for line, 7.8 and 15 kv, 50 amp. Also table of fuse links, both conventional and upsurge for use with various flip-open cutout ratings. 4 pages. Bulletin No. GEA-4224E. B13

Dry-Type Transformers . . . small, general, special purpose GEA-6723. B14

ASA PUBLICATIONS: Order from American Standards Assn, 70 E 45 St, New York 16, N. Y.

American Standard Schedules of Preferred Ratings for Power Circuit Breakers. C37.6-1957. $0.40. B15

Guide for Installation and Maintenance of Dry-Type Transformers. C57.94. $0.50. B16

Guide for Installation and Maintenance of Oil-Immersed Transformers. C57.93. $0.75. B17

NEMA PUBLICATIONS: National Electrical Mfg Assoc, 155 E. 44 St, New York 17, N. Y.:

Split-Bolt Connectors, unplated vise type for copper conductors. SG 14-1958. 8 pages. Price 20¢. B18

L-V Power Circuit Breakers. SG 3-1958. 59 pages. Price $3.00. B19

Lightning Arresters. No. LA 1-1958. 23 pages. Price: $2.75. B20

Electric Power Connectors. No. SG 1-1958. 16 pages. Price: $1.80. B21

Apparatus Insulators. Characteristics of cap and pin type and post type given in three tables. HV 1-1958. 8 pages. Price: 25¢. B22

Glass Fabric, Yellow Varnished. No. VF7-1958. 12 pages. Price: 75¢. B23

RELAYS AND METERS

PROTECTIVE RELAYS: Line of protective relays is discussed in 16-p catalog 5-020. Fifteen models, representing eight different types are featured, and applications, special features, design settings, burdens, contacts and case of each is given. Federal Pacific Electric Co, 50 Paris St, Newark 1, N. J. B24

RELAY TESTING . . . with "Multi-Amp" . . . Descriptions of relays of various manufacturers and relay-testing methods, 18-page booklet. Also, data sheet 167 on portable test instruments, 1004 series. Multi-Amp Corp, 465 Lehigh Ave, Union, N. J. B25

METERS: 8-p quarterly technical bulletin, "Meters" describes problems in instrumentation and measurement, and suggests methods for overcoming them. Industrial Products Div, International Telephone & Telegraph Corp, 250 Garibaldi Ave, Lodi, N. J. B26

LIGHTING

HIGHWAY LIGHTING is treated in every detail of engineered safety 'round the clock for superhighways and modernizing existing highways, Highway Lighting Reference Guide, $1. Based on standard practises, developed by Illum. Eng. Society, American Standards Assoc. State Highway Lighting Com. of the Street and Highway Safety Lighting Bureau, 1400 Terminal Tower, Cleveland, O. or 155 E. 44 St., New York N. Y. B27

MODULAR LIGHTING . . . Recessed and surface-mounted fixtures for commercial and home use, with application data. 12 pages. Form No. 1705. Moe Light Div of Thomas Industries Inc, 410 South Third St., Louisville 2, Ky. B28

WESTINGHOUSE PUBLICATIONS . . . Westinghouse Electric Corp, Lighting Div., Edgewater Park, Cleveland, O.

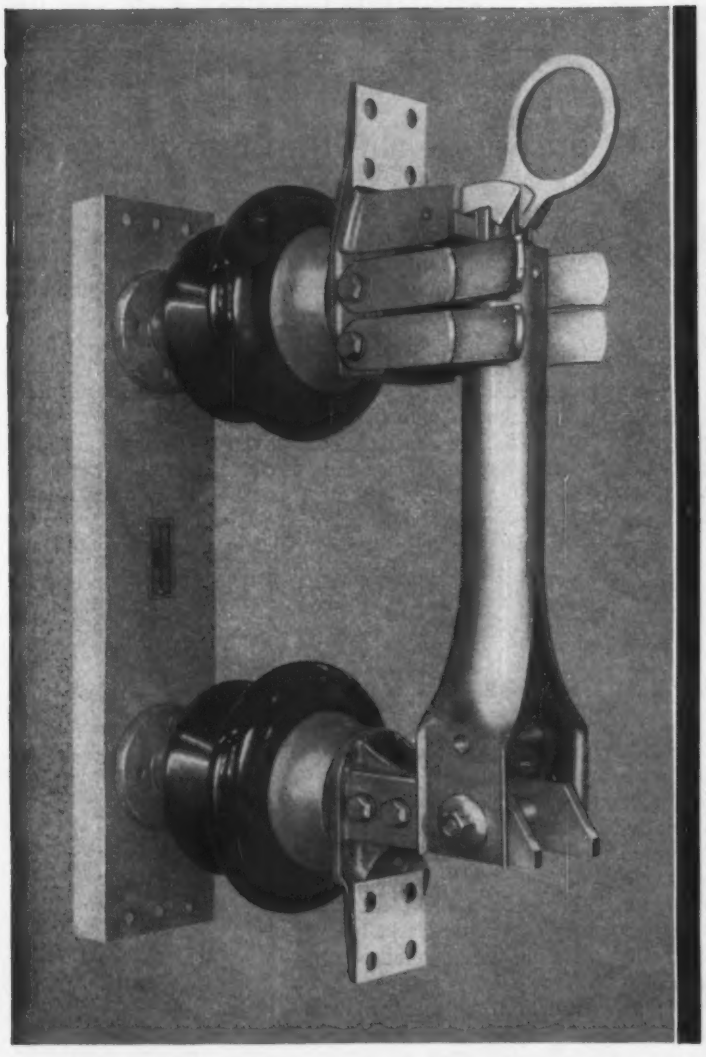
Mainliner for fluorescent street-lighting. Contour-engineered reflector and dual optical systems. 4 pages. B29

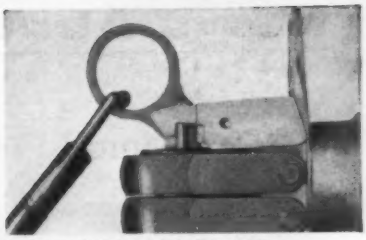
Silverliners, OV-25, for roadway lighting. 400-watt mercury lamps in six designs. B-7255. B30

INDUSTRIAL

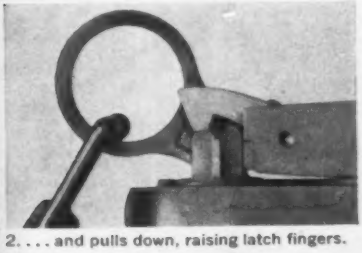
LIQUID LEVEL CONTROLS: Line of liquid level controls for universal industrial application is described and illustrated in 16-p brochure. Photoswitch Div, Electronics Corp of American, One Memorial Drive, Cambridge, Mass. B31

PRE-FAB DISTRIBUTION SYSTEM "Masterguard", plug-in feeder, service entrance equipment, plug-in power take-off. 4 pages. Electric Distribution Products, Inc, 2210 31 St., SW, Allentown, Pa. B32

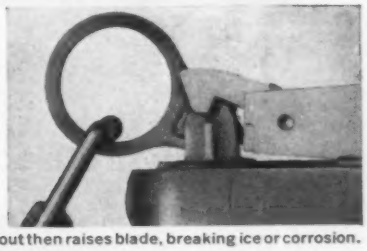




1. Operator inserts switch hook into 3-inch ring . . .



2. . . . and pulls down, raising latch fingers.



3. Blade pryout then raises blade, breaking ice or corrosion.

4. Blade is opened . . . latch returns to original position, ready for re-entry of blade.

RUGGED, POSITIVE-ACTING OUTDOOR DISCONNECT . . . the DELTA-STAR hook-operated B-2K switch

Here is a reliable heavy-duty hook-operated switch which offers the maximum in efficiency and ease of operation. Extreme rigidity of the tubular blade and formed hinge prevents contact misalignment even when the operator must stand to one side to open or close the switch.

A strong blade pryout makes operation positive even under heavy ice and corrosive conditions. The spring-loaded blade latch prevents opening under short circuit. Large hook ring eliminates difficulty of inserting hook.

High-pressure contacts of rugged construction plus ample material for heat dissipation assure efficiency.

B-2K switches are available in ampere ratings of 400, 600, and 1200, and voltage ratings from 7.5 to 161kv.

FREE CATALOG. Send for this new illustrated brochure, which gives full technical information on Delta-Star B-2K Disconnect Switches. Write today to Dept. 128, Delta-Star Electric Division H. K. Porter Company, Inc., 2437 Fulton Street, Chicago 12, Illinois. District offices in principal cities.

H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

Connors Steel, Delta-Star Electric, Disston, Forge and Fittings, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan-Kidd Steel, H. K. Porter Company (Canada) Ltd.

News About People

Horton Named President of Southern California Edison

QUINTON

HORTON

Harold Quinton, president and chief executive officer of Southern California Edison Co, has been elected chairman of the board, effective February 1, 1959. While resigning the presidency, he will continue as chief executive officer. He succeeds W. C. Mullendore who is retiring. J. K. Horton, a vice president of Pacific Gas & Electric Co and president of the Alberta & Southern Gas Co Ltd., has been elected president of Southern California Edison.

Quinton joined the company in 1942 as vice president in charge of finance. He was elected executive vice president in 1948 and president in 1954. Horton was elected secretary and legal counsel of Pacific Public Service Co in 1944 and in 1952, president of the top company and its constituent operating companies.

Bangor Hydro-Electric Appoints Haskell President

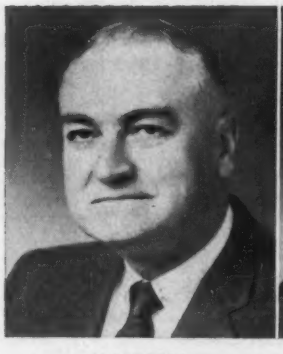
Robert N. Haskell, executive vice president of Bangor Hydro-Electric Co and president of the Maine Senate, has been elected president of Bangor Electric. He succeeds Edward M. Graham who is retiring after 37 years as company president, but who will continue as board chairman. Haskell will resign his Senate post.

Starting in as a draftsman in 1921, while still an electrical engineering student at the University of Maine, Haskell designed the Machias automatic generating station, pioneer of its type in New England.

In 1926, he was made a construction engineer on the Ellsworth-Eastport transmission project, then for two years was field engineer in charge of all line construction. In 1929, he was named head of all merchandising activities and vice president.

HASKELL

Moxness Gets Top Post at Northwestern Public Service



MOXNESS

SCHMIDT

Northwestern Public Service Co has appointed S. A. Moxness president and chief executive officer, succeeding G. R. McArthur. At the same time, A. D. Schmidt has been elected vice president-operations. All changes were effective November 1.

Moxness joined the company in 1933 at Mobridge, South Dakota. In 1934, he went to the main office as chief accountant. From 1944 to 1955 he was manager of the Huron division. He was elected vice president in 1955 and a director in 1958.

Schmidt joined the utility in 1949 as a cadet engineer. Subsequently he held posts as gas engineer, and a safety director, assistant superintendent of production, and superintendent of gas properties.

MacArthur will become vice-chairman of the board.

new high pressure closure for Ross feedwater heaters

Open for your inspection, during tube welding, this is the business end of a Ross Feedwater Heater. Take an inside look at the most unique High Pressure Closure in the business. It's brand new.

Only four major parts complete the assembly and she's ready to perk . . . pass partition cover, channel cover, two flange rings. That's all *you'll* need to handle at maintenance time. *Simple* is the word!

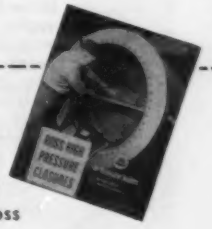
. . . so is *ruggedness.* The exceptionally high safety factor built into the load carrying cover and channel is more than double ASME Code requirements. Construction prevents overload of main engagements when tightening studs. Differential expansions between channel and cover do not affect channel wall, while bearing surfaces are spaced identically for uniform load. Temperature stresses from start-ups or load changes are virtually non-existent. There's more . . . much more!

American-Standard and Standard ® are trademarks of American Radiator & Standard Sanitary Corporation.

AMERICAN-Standard
ROSS HEAT EXCHANGER DIVISION

NEW BULLETIN

You'll have to see the detailed design features of this new Ross development to fully appreciate the tremendous advantages. They are illustrated and described in new Bulletin 201.1K1. Mail coupon for your copy.



AMERICAN-STANDARD
ROSS HEAT EXCHANGER DIVISION
BUFFALO 5, N. Y.

Please send your new Bulletin 201.1K1 describing high pressure closures for Ross Feedwater Heaters.

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COMPANY _____

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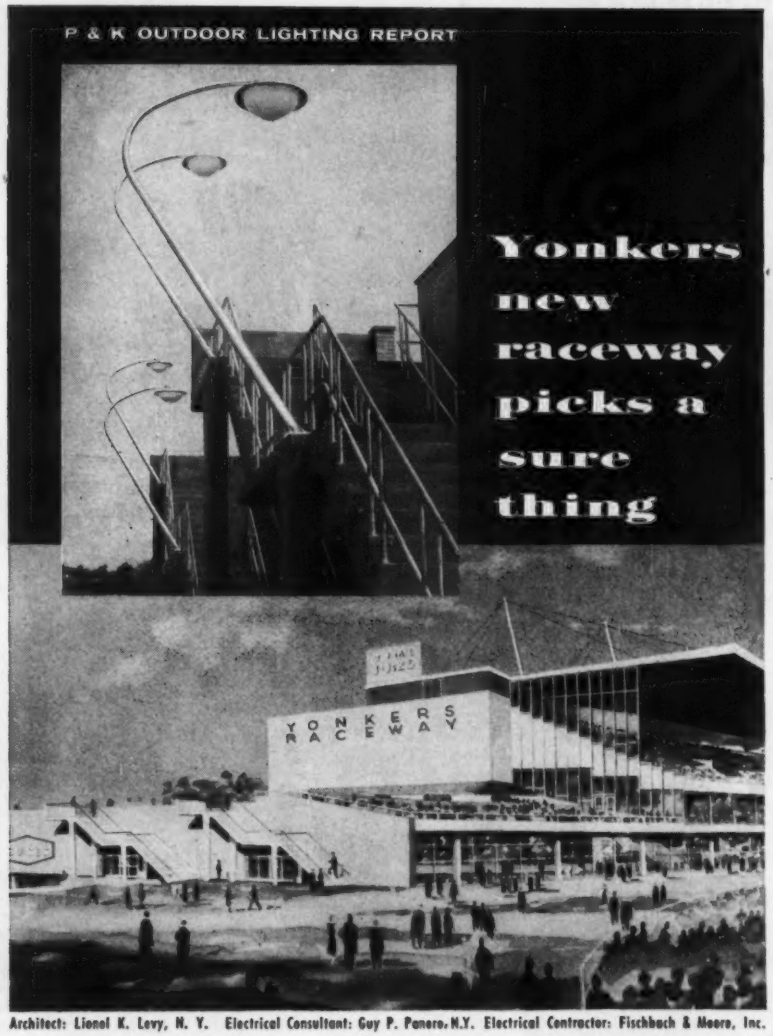
EW 1158



Architect: Lionel K. Levy, N. Y. Electrical Consultant: Guy P. Panero, N.Y. Electrical Contractor: Fischbach & Moore, Inc.

CIRCLElux DAVITS LIGHT THE WAY

Here, at the country's newest and most luxurious track, P&K all-aluminum CIRCLElux davit-style lighting standards were chosen. Their natural functional beauty add a modern complement to the surroundings. For example, the units illustrated are 10 foot gracefully arched davits with our CIRCLElux fluorescent luminaire. CIRCLElux incandescent luminaires were used in other applications at the raceway.

The wide range of styles available, along with the choice of three lighting sources—incandescent, fluorescent, and mercury vapor—enables you to effectively customize any installation with a "package" unit, standard and luminaire, complete and ready for installation. This means easier specifying and easier installation, and it is good to know that P&K aluminum standards never require painting or other costly maintenance, keep their good looks for years and years.

For more facts send for bulletin LTG-30 describing the complete range of CIRCLElux lighting packages.

P&K

PFAFF & KENDALL 84 FOUNDRY ST., NEWARK 5, N. J.

IN CANADA: POWERLITE DEVICES, LTD., TORONTO, MONTREAL, VANCOUVER
EXPORT REPRESENTATIVE: PHILIPS EXPORT CO., NEW YORK, N. Y.

Ruese Made OVEC VP-Operations

Wilbur H. Ruese has been elected vice president in charge of operations for Ohio Valley Electric Corp and its subsidiary, Indiana—Kentucky Electric Corp. He is presently superintendent of electrical operations for OVEC. He will assume all duties formerly held by Fred R. Shedd who died October 22.

A 40-yr veteran of the utility business, Ruese started with the Miami Valley Electric Co in 1918. Five years later he joined the firm's parent company, Kansas Electric Power Co. In 1926 he was transferred to Lawrence, Kansas and in 1934 rose to vice president in charge of engineering and operations.

When the company merged with Kansas Power & Light in 1949 he took over as chief electrical engineer for the enlarged system. He joined OVEC in 1954.

PERSONAL BRIEFS

British Columbia Electric Co's Electrical Division has made these promotions recently: **F. A. Lazenby** has become assistant chief engineer (executive) and **G. F. Green,** assistant chief engineer (technical services).

Anthony J. Wolf, formerly with the Detroit Edison Co's system design and planning department, is opening an office in downtown Detroit. It will be known as Pierce & Wolf, consulting engineers.

Dayton Power & Light Co has named **Fred D. Norris** supervisor of the advertising and publications department.

Westinghouse Electric Corp has appointed **Bruce D. Henderson,** vice president, to the staff of John K. Hodnette, executive vice president. **Raymond K. Serfass** will replace Henderson as manager of the Air Conditioning Division.

Michael A. Black has retired after 49 years with the Okonite Co.

Keith J. Evans is retiring from Joseph T. Ryerson & Son, Inc, after 46 years of service.

Rome Cable Corp has named **Albert W. Dudreck** advertising and sales promotion manager.

Donald C. Burnham has received the Richards Memorial Award "for outstanding achievement within 20-25 years after graduation from college,"—Burnham is vice president in charge of manufacturing for the Westinghouse Electric Corp.

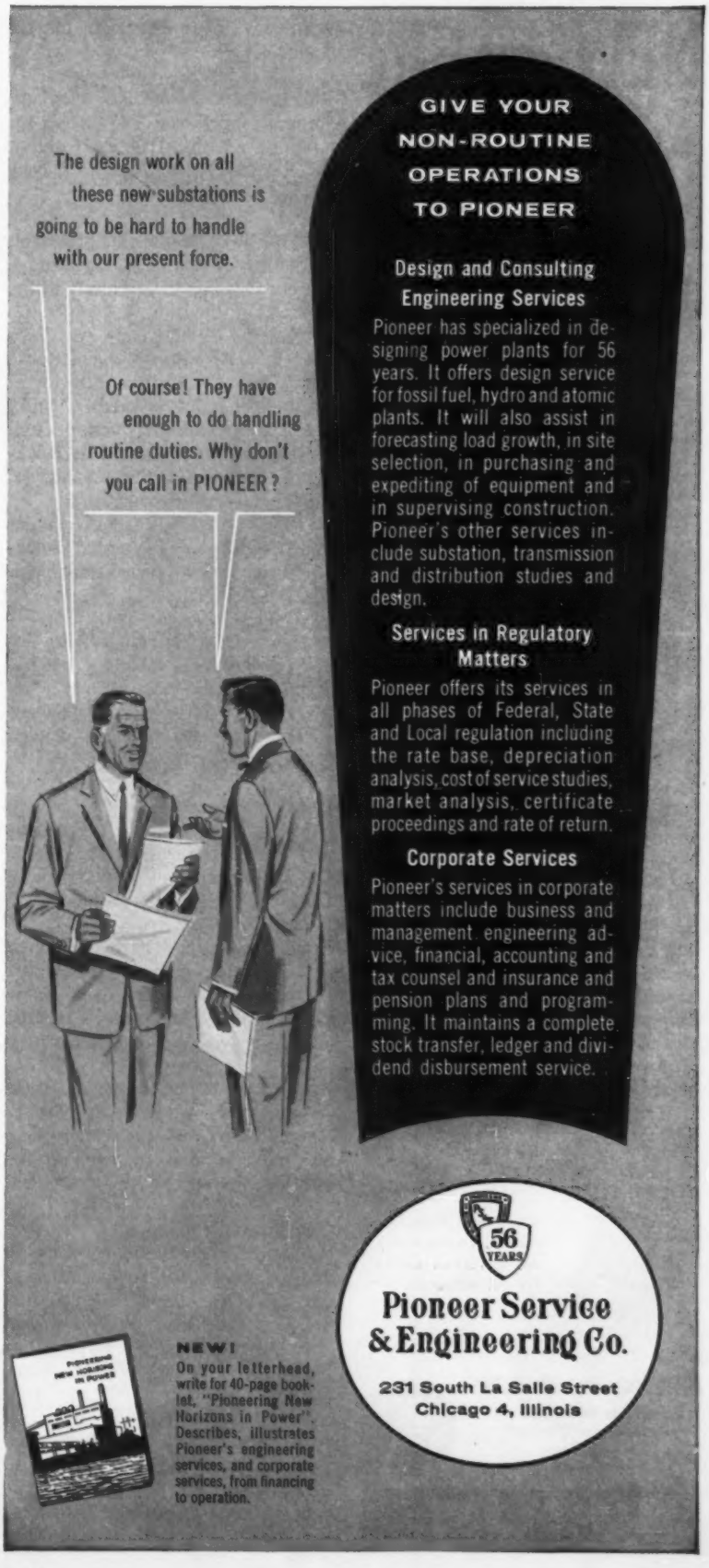
RCA Service Co has appointed **Harry Reese, Jr,** to manager, atomic energy services.

Barclay Morrison has been made assistant marketing manager for the Carpenter Steel Co.

Allis-Chalmers Manufacturing Co's West Allis Works has recently made these appointments: **Herbert D. Bickley,** analyst, engineering analysis section; **Roy L. Heard,** application engineer, switchgear department; and **Charles Prodoehl,** application engineer, electrical application department.

There have been three changes at General Electric Co. **Harold J. Parker** has been named manager-finance for the large steam turbine-generator department. **Bill Gluesing,** founder of the "House of Magic," and **R. J. Swackhamer,** manager of user industries sales, have retired.

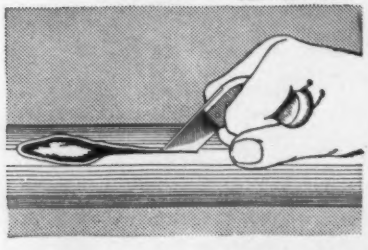
Minneapolis-Honeywell Regulator Co's Brown Instruments Division in Philadelphia has named **Warren W. Lee** eastern region sales supervisor for systems engineering. He replaces **J. T. Teed,** who has become


The design work on all these new substations is going to be hard to handle with our present force.
Of course! They have enough to do handling routine duties. Why don't you call in PIONEER?
GIVE YOUR NON-ROUTINE OPERATIONS TO PIONEER
Design and Consulting Engineering Services
Pioneer has specialized in designing power plants for 56 years. It offers design service for fossil fuel, hydro and atomic plants. It will also assist in forecasting load growth, in site selection, in purchasing and expediting of equipment and in supervising construction. Pioneer's other services include substation, transmission and distribution studies and design.
Services in Regulatory Matters
Pioneer offers its services in all phases of Federal, State and Local regulation including the rate base, depreciation analysis, cost of service studies, market analysis, certificate proceedings and rate of return.
Corporate Services
Pioneer's services in corporate matters include business and management engineering advice, financial, accounting and tax counsel and insurance and pension plans and programming. It maintains a complete stock transfer, ledger and dividend disbursement service.
NEW!
On your letterhead, write for 40-page booklet, "Pioneering New Horizons in Power". Describes, illustrates Pioneer's engineering services, and corporate services, from financing to operation.
56 YEARS
Pioneer Service & Engineering Co.
231 South La Salle Street
Chicago 4, Illinois

NEW KLEIN
slitting tool
for all types of control cable

Patents 2398979
2691822

Cat. No. 1558



Here is a new tool developed by Klein, designed to slit insulation from flexible cords, PWC, telephone cable with vinyl or polyethylene jackets and bus drop.

Handle of cast aluminum, light in weight and with convenient grip; knife of tempered tool steel may be sharpened and is easily removed for replacement. This tool slits insulation from a few inches to as many feet as desired swiftly and simply. Does not damage conductors inside weatherproof sheath.

Write for bulletin giving complete information.

FREE POCKET TOOL GUIDE

A free copy of the new Klein Pocket Tool Guide will be sent on request without obligation.

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp. New York

Mathias KLEIN & Sons
Established 1857 Chicago, Ill., U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS

petroleum instrumentation market manager.

Robert W. Gardner has been appointed supervisor of distributor relations for the Triangle Conduit & Cable Co of New Brunswick, New Jersey.

J. A. McInay elected vice president, marketing of The Electric Storage Battery Co. He was formerly in the Ray-O-Vac Division.

John F. S. Abbott has joined Rockbestos Products Corp as director of research and development. A new department called Production Engineering has been formed at Rockbestos. **James F. McClelland, Jr,** will direct it as manager.

Leach Corp has appointed **Searle G. Nevius** as senior electronic engineer.

R T & E Corp has made these appointments: **Earl A. Reid** as general manager of the new branch plant in Portland, Oregon, and **Howard A. Dunn** as sales manager—Pacific Coast.

Henry J. Egen, Jr has been appointed manager-tool engineering and metal fabrication for Philco Corp's Government and Industrial Division.

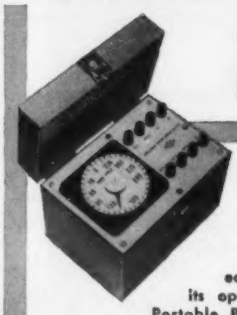
Frank Bernd has been appointed general sales manager of Curtis Lighting, Inc, Chicago, succeeding **C. E. Wolfe,** who resigned to take a position with the Cardox Corp.

Brown Instruments Division, Minneapolis-Honeywell Regulator Co has named **George W. McKnight** to a new post of market manager for utilities instrumentation.

Combustion Engineering, Inc, has announced that **James M. Cowell, Jr.** has joined the organization as director of purchases. He was formerly with Curtiss-Wright Corp, where he served as director of purchases for the Wright Aeronautical Division.

American Society of Mechanical Engineers has just raised **Thomas A. Fearnside,** chief mechanical engineer of Stone & Webster Engineering Corp, to the grade of Fellow.

PORTABLE PHASE ANGLE METER



Completely self-contained, and requiring no auxiliary equipment for its operation, this Portable Phase Angle Meter offers a direct way of checking relay and instrument connections, particularly directional over-current relays, differential relays or similar equipment. It may also be used to measure the prevailing power factor in each phase of a polyphase watthour meter installation. The device has a frequency of 60 cycle, with voltage ranges of 60, 120 and 240 volt. Current ranges are 1, 2.5 and 5 amp. . . . DIMENSIONS: 9½ x 6¾ x 5⅝ inches. Weight 19 pounds.

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HA-2

Sales Assignments

COMPANY STAFFS

Philco Corp, Government and Industrial Division, has named Ronald J. R. Kallman western regional manager for Transac computer systems. His headquarters will be at Philco's Western Development Laboratory, Calif.

Sylvania Electric Products Inc has appointed Thomas H. Cashin product sales manager, Industrial-Commerce Lamp Sales. Carl M. Long has been named to replace him as Buffalo district sales manager for Sylvania Lighting Products Division.

Delta-Star Electric Division, H. K. Porter Co, Inc, has named R. E. Willis district manager of its new office in Seattle. It is located at 925 Securities Building, 3rd Ave and Stewart St, Seattle, Wash.

RT&E Corp's Portland plant has named the T. R. Van Wagoner Co as its representative in Salt Lake City, located at 1415 South Main St, Salt Lake City, Utah.

Hill Transformer Co which is expanding its marketing facilities into the Rocky Mountain and Southwest areas has appointed the following sales representatives: Ralph B. Black for the New Mexico and El Paso areas; Burrus & Matthews Co, Southern, Central, and Northern Texas; H. C. Guire & Co, Colorado and Eastern Wyoming; and Stevens Sales Co, Southern Idaho and Western Wyoming.

Clark Bros Co, division of Dresser Industries, has appointed George L. O'Connor to the newly created post for the promotion and sale of gas turbines in the eastern half of the United States.

I-T-E Circuit Breaker Co has recently made these sales appointments: Fred Thornton district manager of the new Omaha office, located in the Dodge Center Building, 5002 Dodge St; John C. Swander district manager for the new I-T-E office in Davenport, located in the Citizens Federal Building, 218 Brady Street, and C. L. Roberts to the sales staff of the Minneapolis district offices.

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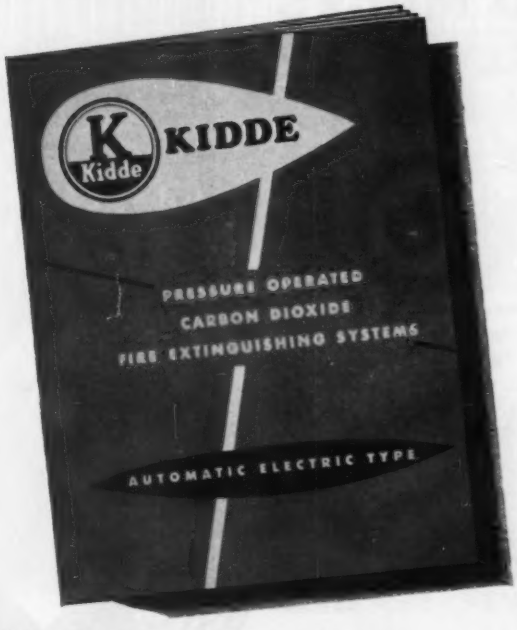

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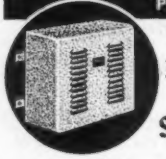

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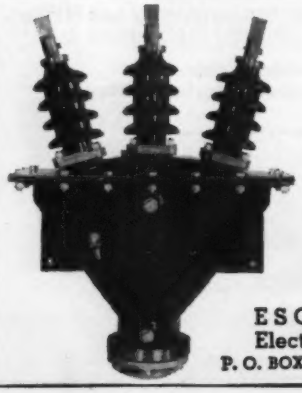

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AEIC Meeting

(Continued from page 94)

designs, design criteria for electrostatic precipitators built to remove the small amount of particulates from oil-fired stack effluents were established. A full-scale precipitator has been ordered and is being erected on an existing 156 mw generating unit. Particle removal efficiency of 90% has been guaranteed. A bag-house of pilot-plant size, equipped with siliconized glass fiber bags, is also being tested and has shown collection efficiencies of better than 90% of fine particles" . . .

"Reduction of about 40% in nitrogen fixation by modifications at existing front fired furnaces are believed to be practical . . ."

"A . . . recent development (in dust collectors) is in automatic voltage control, to keep the voltage up to just below the spark-over point. This avoids a falling off in collector efficiency in the hands of operators who humanly, sometimes, like to operate collectors at a low, 'non-trouble' voltage."

Report of Committee on Water Requirements

A. L. PENNIMAN, JR., Vice President, Baltimore Gas and Electric Co

"It is the committee's understanding that its assignment is:

1. To become familiar with the more significant developments relating to water requirements;

2. To interpret and report such information to the Association; and

3. To recommend appropriate policies."

"Your committee offers from the information now at hand, the following more or less obvious recommendations of policy:

1. Make every reasonable effort to avoid arousing the public by objectionable conditions or nuisances

from power plant effluents;

2. Study pertinent data on effluent water from existing power plants; and encourage research to determine its effect on streams;

3. Study what other industries are doing in this field;

4. Pursue the thesis that reasonably elevated effluent temperatures do not adversely affect, and may be advantageous to aquatic life;

5. Actively cooperate with those organizations in each community that are interested in water conservation;

6. Keep in touch with proposed water-control legislation.

Switch to Electronic Billing

(*Continued from page* 61)

the problems discovered during the first month of billing operations. It also is recommended that, just prior to the beginning of billing on a new system, meetings be held with customer-contact employees, in addition to customer-accounting employees, to completely explain the system, acquaint them with the new forms, and review the capabilities and limitations of the system.

The original survey contemplated that the changeover to the new system would be accomplished by the reduced number of employees estimated to be required to operate the new system when completely installed. However, experience throughout the changeover period dictated that all the personnel engaged in customer accounting work in each division be continued for at least three months beyond the effective date of change, in order for the personnel to be assigned permanently to the new work to become generally familiar with the new system.

Allowing for customer accounting employees required to be added since the installation of the new system by reason of the steady increase in number of installed meters, the estimated reduction in personnel and other customer accounting expenses have been or are expected to be fully realized by the close of 1958. In achieving this goal, no customer accounting employees were laid off: retirements, resignations and transfers to other departments requiring additional help made this unnecessary.

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3—333 KVA G-E 2400-240x480
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3	1000	G.E.	66,000-33,000
3	1000	G.E.	66,000-2300/4000
3	300	West.	69,000-6900
1	2500	Mol.	44,000-2400/4160, 3 Ph.
3	500	G.E.	44,000-2400/4160
3	200	West.	44,000-480
1	5000	West.	34,500-13750/6875, 3 Ph.
1	3750	G.E.	34,400-13800/7960, 3 Ph.
2	3000	Uptegraff	34,750-4160, 3 Ph.
2	1500	G.E.	34,400-2520, 3 Ph.
3	1000	A.C.	34,650/11,500-2300
3	200	A.C.	34,500-2400/7200/12470Y
1	3000	A.C.	23,380-2500/4300Y, 3 Ph.
2	1500	G.E.	23,000-2400/4800, 3 Ph.
1	7500	A.C.	13,800-2400, 3 Ph.
3	2500	G.E.	13,800-2300, 3 Ph.
3	1667	G.E.	13,800-600
3	667	Kuhl.	13,800-480
1	600	Stard.	13,200-2300, 3 Ph.
1	450	Penna.	13,200-2400, 3 Ph, Askarel
3	333	Uptegraff	13,800-480
1	4500	West.	7200-2400, 3 Ph.
3	333	Mol.	7200/12470-2400/4160
3	125	A.C.	6900-2300
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Wanted: Electric Distribution Engineer with college education and utility experience for a job open in a utility company in Southern Connecticut. Send complete resume of age, experience, and salary expected to P-9218, Electrical World.

Wanted—Electrical Engineers, experienced in electric utility work on 13.2 Kv and 4160 Volt electric drafting. Work will be in Electrical Engineering Department. Location: municipal utility in Central Michigan. All usual Job benefits. Salary will be dependent on qualifications. Send complete experience and education resume to P-9317, Electrical World.

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The Meetings Calendar

DECEMBER

American Society of Mechanical Engineers—Annual Meeting, Statler & Sheraton McAlpin Hotels, New York City, Nov. 30-Dec. 5.

American Mining Congress — Annual Membership Meeting, Plaza Hotel, New York, N. Y., Dec. 1.

American Society of Refrigerating Engineers — 45th Semi-annual Meeting, Roosevelt Hotel, New Orleans, La., Dec. 1-3.

Edison Electric Institute—EEI-AGA Electronics Seminar, Commodore Hotel, New York City, Dec. 1-3; Electric Space Heating and Air Conditioning Committee, St. Louis, Mo., Dec. 4-5; Street Lighting Committee, Hendersonville, N. C., Dec. 10-11; Industrial Relations Committee, EEI Headquarters, New York City, Dec. 4.

National Warm Air Heating and Air Conditioning Association—Annual Convention, Cleveland, Ohio, Dec. 1-4.

The American Society of Mechanical Engineers—23rd National Exposition of Power & Mechanical Engineering, New York Coliseum, New York City, Dec. 1-5.

• **National Safety Council**—Executive Committee, training conference for 1st line supervisors in the public utility field, George Washington Hotel, Jacksonville, Fla., Dec. 1-5.

Eastern Joint Computer Conference & Exhibit—Sponsored by American Institute of Electrical Engineers, Institute of Radio Engineers and Association for Computing Engineers, Bellevue-Stratford Hotel, Philadelphia, Pa., Dec. 3-5.

Institute of Radio Engineers—Annual Conference of the Professional Group on Vehicular Communications, Sherman Hotel, Chicago, Ill., Dec. 4-5.

Electric Companies Public Information Program—Steering Committee, Palmer House, Chicago, Ill., Dec. 8.

American Nuclear Society—Annual Meeting, Sheraton Cadillac Hotel, Detroit, Mich., Dec. 8-10.

Interstate Power Club—Final Meeting, Hotel Martinique, New York City, Dec. 8.

• **National Electrical Manufacturers Association** — Standard Committee for Turbine Generator Sets, NEMA Office, Dec. 10.

Washington Public Utility Districts' Association—Annual Membership Meeting, New Washington Hotel, Seattle, Wash., Dec. 11-12.

JANUARY - 1959

• **International Home Furnishings Market**—The Merchandise Mar, Chicago, Ill., Jan. 5-16.

American Society of Heating & Air Conditioning Engineers—14th International Heating & Air-Conditioning Exposition, Convention Hall, Philadelphia, Pa., Jan. 26-29.

• **Canadian Electrical Association**—Eastern Zone Section Meetings, Chateau Frontenac, Quebec, P. Q., Canada, Jan. 26-29.

• **Doble Clients Conference**—26th Annual Meeting, Sheraton Plaza Hotel, Boston, Mass., Jan. 26-30.

• **Public Utilities Advertising Association**—Regional Meetings, Timberline Lodge, Portland, Oregon, Jan. 29-30.

• **Edison Electric Institute**—Industrial Power & Heating Group, Atlanta, Ga., Jan. 15-16.

Pennsylvania Electric Association—Communications Committee, January 22-23; System Operation Committee, Fort Stanwix Hotel, Johnstown, Pa., January 29-30.

FEBRUARY

• **American Institute of Electrical Engineers**—Winter General Meeting, Statler and Sheraton-McAlpin Hotels, New York City, Feb. 1-6.

• **Pennsylvania Electric Association**—Transmission & Distribution Committee, Feb. 5-6; Prime Movers Committee, Pittsburgh, Pa., Feb. 12-13; System Planning Committee, Philadelphia. Pa., Feb. 16-17; Electric Equipment Committee, Philadelphia, Pa., Feb. 19-20; Relay Committee, Pittsburgh, Pa., Feb. 26-27.

• **Missouri Valley Electric Association**—Industrial and Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 5-6.

• **National Electrical Week**—Feb. 8-14.

• **American Society of Civil Engineers**—Convention, Los Angeles, Calif., Feb. 9-13.

• **National Rural Electric Cooperative Association** — Annual Meeting, Shoreham Hotel, Washington, D. C., Feb. 9-12.

• Additions this week.

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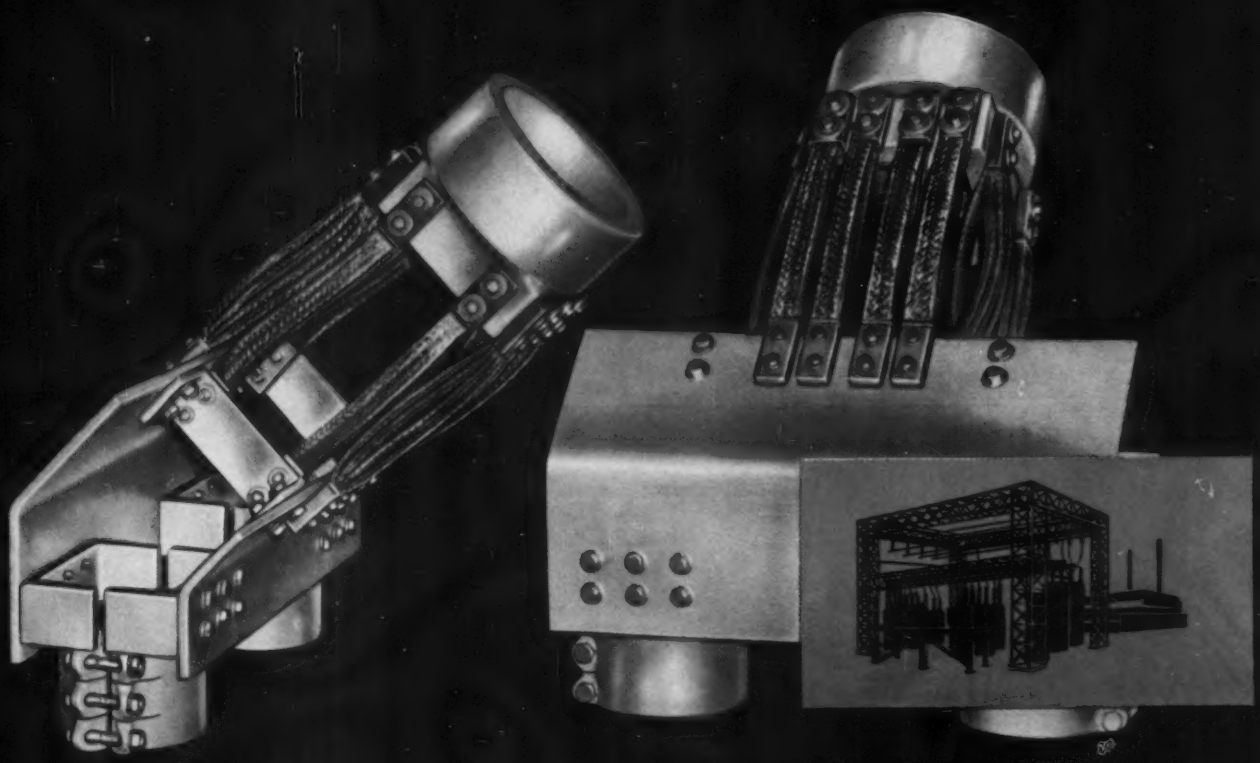

Where standard connectors can't do the job, Burndy designs "specials." Shown here is one of three Burndy connectors designed to save 100 lbs. each in weight. Linking aluminum bus to copper studs of 220,000 kva transformer, connectors are flexible, have 45° angle so stud portion can be swung aside when necessary.

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ON DEVELOPING BETTER ELECTRICAL CONNECTIONS

From generator bus to service drop, the transmission and distribution of electricity depend on the design of the millions of electrical connectors that tie the system together. The design of Burndy connectors is based on 35 years experience with utility practices and with the electrical and mechanical design principles essential to produce dependable electrical connectors.

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58-17

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HOUSEPOWER HIGHSPOTS

Harold Lanchantin, LILCO training specialist, discusses the Registered Electrical Contractor program in HOUSEPOWER Forum. 210 contractors have successfully completed the Forum to date.

HOUSEPOWER™ installations leaped 43% with "Lil" leading the way!

Long Island Lighting scores with coordinated program for contractors

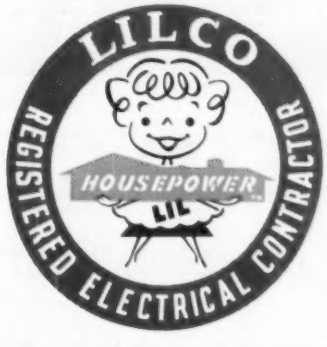
Key man in a successful HOUSEPOWER campaign, as Long Island Lighting Company analyzes it, is the electrical contractor. So LILCO developed a 7-point promotion plan to build contractor cooperation and enthusiasm.

The program includes:

1. Sales training
2. An emblem, LILCO's "Lil", symbolizing utility and contractor joint sponsorship
3. Sales lead system
4. Sales aids and promotion material
5. Field promotion assistance
6. HOUSEPOWER finance plan
7. Advanced selling conferences for contractors

To date, 210 electrical contractors have completed the HOUSEPOWER Forum and have become LILCO Registered Electrical Contractors.

And in 1957, over 11,000 HOUSEPOWER installations were made on the LILCO system—a 43% increase over the previous year!



Here's "Lil", the emblem which marks electrical contractors who graduate from HOUSEPOWER Forum. They feature it on trucks, shop windows, letterheads and advertising.

"Here is an example of a well conceived, coordinated program, aggressively followed. The results it has achieved labels it an outstanding success," says J. H. Watkins, vice president and manager of the Transformer Division, Kuhlman Electric Co.

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